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FIGURES #2 -13 OVERSIZE MAPS - PARTIALLY SCANNED

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REMEDIAL INVESTIGATION REPORT
VOLUME 5
(Binder 1 of 3)

APPENDIX N:

MIDDLE FORK OF LITTLE BEAVER CREEK

Submitted to :

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

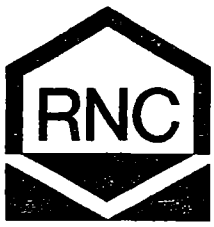
REGION 5, CHICAGO, ILLINOIS

and

OHIO ENVIRONMENTAL PROTECTION AGENCY

COLUMBUS, OHIO

Submitted by :



RUETGERS-NEASE CORPORATION

STATE COLLEGE, PENNSYLVANIA

MAY 1996

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September 19, 1997

Project No.: 933-6154

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RE: NEASE SITE, SALEM, OHIO
REMEDIAL INVESTIGATION REPORT: VOLUME 5
APPENDIX N: MIDDLE FORK OF LITTLE BEAVER CREEK

Dear Sheila and Joe:

Please find enclosed Appendix N of the Remedial Investigation (RI) Report revised text responding to your Comments letter dated June 30, 1997. This revised text replaces the Revision 0 Appendix N text submitted to the Agencies in May 1996. It is our understanding that the entire Remedial Investigation (not including the Risk Assessment), is now approved by the Agencies.

Please feel free to call if you any questions.

Very truly yours,

GOLDER ASSOCIATES INC.

Todd H. Rees, Ph.D., P.E.
Senior Environmental Engineer

P. Stephen Finn, C.Eng.
Project Director and Principal

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1.0 INTRODUCTION

Pursuant to an Administrative Order of Consent (AOC) effective February 18, 1988, Ruetgers-Nease Corporation (RNC) performed an investigation of the Middle Fork of Little Beaver Creek (MFLBC) in 1990, including sampling and analysis of surface water, sediment, floodplain soil, and fish tissue from stations along the MFLBC and several of its tributaries. The investigation was conducted in accordance with the approved Remedial Investigation (RI) Work Plan (Revision 4) submitted by RNC on February 28, 1990. The results of the 1990 MFLBC investigations were presented in the Partial RI Report dated April 5, 1991 (and summarized herein in Section 2.1), and were used in conjunction with the results of the U.S. Environmental Protection Agency (USEPA)/Ohio Environmental Protection Agency (OEPA) sampling program performed in August and November 1987 and the OEPA survey of the MFLBC performed in 1985 to determine the need for, and locations of, additional samples downstream from the Nease Chemical Site (Site). The Report of April 5, 1991 was considered to be a partial product because it did not include a remedial investigation or endangerment assessment for the RNC manufacturing site (on-Site areas). The report also contained several data gaps regarding the characterization of contamination in the creek sediments and floodplain soils, and the general characterization and assessment of impacts to the ecological units within the creek itself, creek corridors and Egypt Swamp (off-Site areas).

Pursuant to the additional work provisions of Paragraph XIII of the AOC, RNC recommended in the April 5, 1991, Partial RI Report submittal that further investigations be performed on the MFLBC. A MFLBC Phase II program was developed to sample and analyze stream sediments and overbank deposits in the two particular sections of the creek identified in the 1991 Partial RI (from Station 5 to Station 15 and from Station 19 to Station 30, see Figure 1). The primary goal was to characterize mirex distribution in MFLBC floodplain deposits and sediments in the two sections of the creek. RNC submitted to USEPA and OEPA (the Agencies) a MFLBC Phase II Sampling Plan consistent with these

objectives on October 2, 1992. The Sampling Plan was subsequently revised following USEPA/OEPA correspondence dated January 14, and January 28, 1993, and resubmitted on February 4, 1993. USEPA and OEPA (the Agencies) approved the revised MFLBC Phase II Sampling Plan in a letter dated May 8, 1993.

The MFLBC Phase II fieldwork was conducted by ERM-Midwest (ERM) in May 1993. The results of this Phase II sampling are summarized in Section 2.2.2 of this Appendix. Subsequent to completion of Phase II sampling, ERM prepared statistical analyses of the data and submitted a Statistical Analysis Report to RNC in March 1994. Phase II data, along with ERM's Statistical Analysis Report and a conceptual model for mirex distribution along the MFLBC were provided to the Agencies in the Additional Remedial Investigation Report, MFLBC, Nease Site, Salem, Ohio (Additional RI, Golder Associates, 1994) which was submitted on August 18, 1994. Upon reviewing the Statistical Analysis report and proposed conceptual model for mirex distribution, the Agencies determined that the statistical relationships and conceptual model were too tenuous of a basis for remedial decision-making.

In July 1993, RNC submitted a revised RI Report (Revised RI, RNC, 1993) and Endangerment Assessment (EA) addressing Agency comments on the 1991 Partial RI Report. This report was to be comprehensive, integrating the previous 1990 investigations of the MFLBC (Phase I) together with the more recent studies which characterized the nature and extent of contamination at the Site itself, and Phase II of the MFLBC sampling activities which characterized Mirex, Photomirex, and Kepone (MPK) contamination of the creek sediments and surrounding floodplains. However, at the time of the Revised RI's submission, the Phase II data was still being evaluated by ERM. After a preliminary review of the July 1993 Revised RI, the Agencies noted data gaps that had not previously been addressed by RNC and subsequently requested that three additional fieldwork investigations related to the MFLBC be completed, as follows:

1. A field survey of the MFLBC to assess the presence of habitat potentially suitable for the federally endangered Indiana bat;

2. A field survey of habitat types and biota to provide descriptions of the dominant physical and vegetative features of the MFLBC, its riparian zone, and associated wetlands; and

3. Additional wetland soil and sediment sampling within a discrete portion of the MFLBC, known as Egypt Swamp.

All of these investigations were undertaken during the fall of 1993 and factual reports were subsequently submitted to the Agencies (ENVIRON, 1994a, Eastern States, 1993, and ENVIRON 1994b). The reports are included as Attachments N1, N2, and N3, respectively, to this Appendix and are summarized in Sections 3.0, 4.0, and 2.2.3, respectively, of this Appendix. Tabulated results of these investigations are also included in this Appendix. Wetland areas and other habitat information identified on the Habitat Inventory and Stream Survey figures (Eastern States, 1993) are also presented on Figures 2 through 10 of this Appendix.

The Agencies provided comments on the Phase II study (Additional RI, Golder Associates, 1994) in a letter dated February 24, 1995. The Agencies stated that a more extensive evaluation of the data was needed and that additional sampling of the MFLBC was necessary. In a letter to RNC dated March 21, 1995, the Agencies defined the following goals for additional floodplain soil and sediment sampling of the MFLBC:

- Address critical data gaps in MFLBC floodplain soils[1] and sediment[1] data in the reaches of the creek between RI Stations 5 and 15, and between 19 and 31.

- Within these two reaches, focus sampling on areas which potentially present human health and ecological risks. Design sampling using

[1] Sediment is used to refer to substrate within the creek channel which is generally submerged; the term floodplain soil refers to substrate within the floodplain which is not generally submerged

selected risk scenarios involving human and ecological receptors. Other areas must be characterized but to a lesser degree.

Furthermore, the Agencies also requested that additional sediment samples be collected for metals analyses to determine if Site-related metals are present in sediments.

To fulfill these goals, RNC submitted a Work Plan for Phase III Floodplain Soil and Sediment Sampling of the MFLBC (Phase III Work Plan) in June 1995, that identified ten floodplain transects along which thirty-two discrete soil sample locations were situated. In-stream sediment sample locations were also situated along four of the transects. Eleven additional locations were identified at which sediment samples would be collected for metals analyses only. The Phase III Work Plan was approved by the Agencies on July 5, 1995. On July 31, 1995, with Agency concurrence, the Phase III Work Plan was modified; as a result of difficulties in obtaining an access agreement for a property associated with the original location of transect SS95-26B, the transect was relocated to an area approximately 500 feet south of its original location.

Phase III floodplain soil and sediment sampling of the MFLBC was performed in accordance with the modified Phase III Work Plan in September 1995. Section 2.3 of this Appendix text summarizes the Phase III sampling activities, analytical chemistry results, and sample location habitat descriptions. Figure 1 of this Appendix, the MFLBC schematic sampling map, shows Phase I, II, and III sample locations. Detailed representations of MFLBC sampling locations and associated analytical data for Mirex and Photomirex are shown on Figures 2 through 10 of this report.

The purpose of this appendix to the Final RI Report (Final RI, RNC, 1996) is to provide an integrated presentation of all available results from the various investigations of the MFLBC described above so as to define the nature and extent of Mirex in MFLBC floodplain deposits and sediments. Background information is presented in Section 1.0. Sampling programs and associated results are summarized in Section 2.0. The Indiana bat

Habitat Survey is summarized in Section 3.0, and the Ecological Habitat Inventory and Stream Survey is summarized in Section 4.0. Section 5.0 presents an overview of the Supplemental Wetland Soil/Sediment Sampling Of Egypt Swamp and Section 6.0 summarizes the conclusions of the complete MFLBC RI studies.

2.0 MFLBC FLOODPLAIN SOIL AND SEDIMENT INVESTIGATIONS

As described in Section 1.0, sampling activities associated with the MFLBC were performed in three major phases. These sampling programs are summarized below. The Phase I program is described in Section 2.1. The Area 2 and Phase II programs are described in Section 2.2, and the Phase III program is described in Section 2.3. Table 1 of this Appendix summarizes minimum, maximum, and mean concentrations of Mirex, total organic carbon content (TOC), and percent fines detected during all of the MFLBC sampling events (except the initial 1985 OEPA sampling event, the results of which are unavailable). Figures 2 through 10 present detailed locations for Phase I, II, and III samples, along with Mirex and Photomirex results. In cases where both a primary sample and a field duplicate sample were analyzed for a specific parameter, a conservative approach was taken in that the higher of the two results is reported in all summary tables and figures.

2.1 Phase I Sampling Program

The Phase I sampling was performed in 1990 and involved the collection of twenty-eight overbank (i.e., floodplain) soil samples and fifty-four sediment samples.

During the RI, Phase I samples were identified by the prefix SS91, for overbank deposit soils, or SD91 for sediment, followed by the transect number and, for overbank deposit samples, a suffix (01 through 04) to distinguish each location along the transect. Soil samples were analyzed for Diphenyl sulfone, Methoxychlor, and MPK. Diphenyl sulfone and Methoxychlor were not detected. Mirex was detected in eighteen of twenty-four soil samples. Reported concentrations ranged from not detected to 4540 µg/kg, with a mean concentration of 654 µg/kg. Photomirex was detected in eleven of twenty-four samples. Reported concentrations ranged from not detected to an estimated maximum concentration of 132 µg/kg. The mean concentration of Photomirex in soil was 12 µg/kg. Kepone was not detected in Phase I soil samples (see Table 2).

Sediment samples were analyzed for Target Compound List (TCL) volatile organic compounds (VOCs), TCL semi-volatile organic compounds (SVOCs), TCL pesticides, and MPK. VOCs were detected in five of seven samples. Five specific VOCs were detected, two of which may be associated with sources other than the Site. The potentially Site-related constituents, 1,2-Dichloroethane, 1,2-Dichloropropane, and 2-Butanone, were each detected once at low levels (see Table 3).

SVOCs were detected in twenty-seven of thirty-two sediment samples. Twenty-four specific SVOCs were detected. Benzoic acid, detected in two samples, was reported at concentrations ranging from not detected to an estimated maximum concentration of 430 µg/kg. Di-n-butylphthalate, detected in three samples, was reported at concentrations ranging from not detected to an estimated maximum concentration of 74 µg/kg. Diphenyl sulfone, detected in two samples, was reported at concentrations ranging from not detected to an estimated maximum concentration of 170 µg/kg (see Table 4). Of the twenty-one detected SVOCs which are likely to be associated with sources other than the Site, sixteen are Polynuclear Aromatic Hydrocarbons (PAHs).

One TCL pesticide, Heptachlor, was detected in one of twenty-one sediment samples at an estimated concentration of 9.4 µg/kg. The compound was detected in a sample collected upstream from Site and is probably related to sources other than the Site.

Mirex was detected in thirty-six of forty-one sediment samples. Reported concentrations of Mirex ranged from not detected to an estimated maximum concentration of 2820 µg/kg, with a mean concentration of 239 µg/kg. Photomirex was detected in seven of the forty-one sediment samples. Reported concentrations of Photomirex ranged from not detected to an estimated maximum value of 7.38 µg/kg, with a mean concentration of 0.6 µg/kg. Kepone was not detected in Phase I sediment samples (See Table 5).

2.2 Area 2, Phase II, and Egypt Swamp Sampling Programs

In August 1991, OEPA collected soil/sediment samples from the area known as Colonial Villa (CV) mobile home park. This area was subsequently identified as Area 2 and is referred to as such throughout this report. Results are summarized in Section 2.2.1. In May 1993, a second major phase of sampling (Phase II) was performed along the MFLBC by RNC. The Phase II sampling program is described in Section 2.2.2. In November and December 1993, supplemental soil/sediment sampling was performed in the Egypt Swamp in response to Agency requests. This sampling program is summarized in Section 2.2.3 and described in full in the attached document, Supplemental Wetland Soil/Sediment Sampling Of Egypt Swamp At The Nease Chemical Superfund Site, Salem, Ohio (Wetland Soil/Sediment Sampling Report, ENVIRON, 1994b).

2.2.1 Area 2 Sampling Program

In August 1991 fifteen soil samples were collected from Area 2, which is located downstream from the Site on the eastern floodplain of the MFLBC. Samples were analyzed for MPK. Results for Area 2 samples, identified as RNS-SS-09-10 through RNS-SS-09-15 and RNS-SS-09-21 through RNS-SS-09-30, are shown in Table 6 and on Figure 2 of this Appendix.

For Mirex, concentrations ranged from 0.719 µg/kg to an estimated maximum value of 6,650 µg/kg, with a mean concentration of 581 µg/kg. Photomirex was reported at concentrations ranging from 1 µg/kg to a maximum estimated concentration of 104 µg/kg, with a mean concentration of 26 µg/kg. Kepone was not detected.

2.2.2 Phase II Sampling Program

The Phase II sampling program was developed to delineate more extensively the distribution of Mirex along the MFLBC. Mirex concentrations were anticipated to exhibit a dependent relationship with the following variables:

1. Soil/sediment organic carbon content;

2. Soil/sediment grain size;

3. Distance and elevation change from the MFLBC (floodplain soils);and

4. Distance from source.

Such relationships have a strong physical basis derived from the properties of Mirex. Because Mirex is virtually insoluble in water but can be adsorbed to fine grained organic-rich sediments, fate and transport of Mirex within the MFLBC is anticipated to be primarily the result of hydraulic transport of fine grained organic rich sediment. Therefore, Mirex concentrations would be expected to be higher in depositional areas, where sediments and floodplain soils have higher fines content and/or organic content. The lateral distribution of Mirex is expected to be limited by the physics of sediment transport, based on elevation changes across the floodplain, which determine the lateral extent of flooding that occurs during large storm events. After a flood event occurs, the floodwater eventually recedes from the most distant, more elevated areas at first and eventually from areas immediately adjacent to the stream. As a result, areas of the floodplain that are situated closer to the creek, and especially areas that are closer to the creek and sloped more gradually, remain inundated by flowing floodwaters for longer periods than distant areas, and possess greater potential to receive sediments settling from receding floodwater. The flow of the floodwater also decreases as the water recedes, potentially resulting in settlement of sediments. Given these factors, it is expected that samples collected from areas closer to the creek would contain more transported sediment, and therefore potentially higher concentrations of Mirex.

Distribution in the downstream direction is also expected to be limited by the physics of sediment transport, based on stream morphology. Areas of sediment deposition along a stream result from changes in stream morphology. When a relatively shallow streambed changes from a rough substrate, such as a rocky area (a riffle area) to a smoother substrate

(a pool area) and turbulence subsides, particulate matter may no longer be held in suspension and may begin to settle out of the water. When the rate of elevational change in the downstream direction diminishes to a much more horizontal slope, flow may decrease sufficiently to result in sediment deposition. When a streambed distinctly changes direction (i.e., when the stream bends or meanders): the rate of flow in the inner portion of the bend is slower. As a result sediment may be deposited on that inner portion of the streambed. The extent of and frequency of riffle/run areas, pool/depositional areas, and meanders, as well as other morphological attributes of the stream, may therefore limit the transport of sediment (and potentially Mirex bound to sediment) in the downstream direction.

To enable evaluation of the anticipated relationships identified above, Phase II samples were collected from three of the five proposed sampling areas of the MFLBC (see Figure 1) and analyzed for TOC and grain size (GS), as well as for analytical chemistry.

2.2.2.1 Phase II Sampling Activities

The approved MFLBC Phase II Program originally consisted of focused floodplain soil and stream sediment sampling at five selected areas designated Area 1, Area 2, Area 3, Area 4, and Area 5 (see Figure 1 of this Appendix and the Middle Fork Little Beaver Creek Sampling Plan, February 4, 1993, pp. 5-6) downstream from the Site and upstream from Lisbon Dam. However, because access issues in three of the five areas were not able to be resolved by RNC, two areas were dropped from the Phase II Program (Areas 1 and 4) and Area 3 was replaced by Alternate Area 3. In a letter dated May 8, 1993, the Agencies concurred with RNC on the substitution of Alternate Area 3 and encouraged RNC to proceed with the sampling of the three areas while continuing to pursue access for Areas 1 and 4.

Floodplain samples were collected from a depth of 0-6 inches, and sediment (in-stream) samples were collected as a composite of three samples taken within a sediment body. In Area 2, ten floodplain soil samples and three sediment samples were collected. In Alternate

Area 3, fifteen floodplain soil samples and five sediment samples were collected. In Area 5, twenty floodplain soil and three sediment samples were collected. Floodplain soil samples were also collected from a depth of 6-12 inches at five locations within Area 2, for vertical profiling of Mirex. Area 2 was selected for this purpose on the basis that samples collected from a depth of 0-6 inches at Area 2 by OEPA in August 1991 had exhibited the highest Mirex levels detected in samples collected from the MFLBC.

Phase II samples were identified by the prefix SS93, for overbank deposit soils, or SD93 for sediment, followed by station number associated with the given area (09 for Area 2, 15 for Alternate Area 3, or 28 for Area 5), and a suffix to distinguish each specific location within the area. All samples were collected using stainless steel utensils (trowels, hand augers, and triers), and were analyzed for MPK, TOC, and GS analyses. Sampling methods were designed to avoid loss of fines from the material, so that an accurate analysis of grain size could be obtained.

Samples also were collected for QA/QC purposes following protocols stated in the Quality Assurance Project Plan (QAPjP) of the RI Work Plan (Volume 2, Q.A.P.P., Section 6.7.1, pp. 89-90). Figures 11, 12, and 13 of this Appendix show the sample points for Area 2, Alternate Area 3, and Area 5, respectively, and the grid system used to select the sample point locations. Sample locations were selected using the unaligned systematic grid procedure of Gilbert (1987). Locations for Phase II soil samples were selected using a method known as "Stratified Systematic Sampling on an Unaligned Grid" (Gilbert, 1987).

In this method, the area of the overbank located perpendicular to a selected length of creek was determined utilizing an AutoCAD system. This area was then subdivided into gridded blocks with the size of the grid determined using the following equation:

$$\left(\frac{A}{N}\right)1/2$$

Where:

A	=	Area of overbank selected
N	=	Number of samples to be taken within the area

For example, if 20 samples were to be taken within an area of 10,000 ft^2, a grid size of 22.4 feet would be chosen. This grid size creates blocks of 500 ft^2 for 20 samples in 10,000 ft^2.

The sampling point within each block was then determined utilizing a table of random numbers. The starting point in the random number table was picked blindly. If the value of the random number was less than or equal to the length of the gird block, the number was deemed valid and selected as the x-value of an (x,y) pair. The next valid number was selected to be the y-value of the (x,y) pair and this then located the sampling point (measured from the northeast corner of the block) within the block.

2.2.2.2 Phase II Analytical Results

Analyses were performed at Midwest Research Institute of Kansas City, Missouri, and validation of the analytical data was performed by Environmental Standards, Inc. of Valley Forge, Pennsylvania.

The Phase II analytical chemistry results, along with TOC and GS results, are presented in Table 6 of this Appendix. In Table 6, results of the grain size analyses are presented as D_{10}, D_{30}, and D_{60} (μm) size fractions (particle sizes below which 10%, 30%, and 60% of soil by weight is composed, respectively). In Table 6A, percent fines and TOC results for Phase II samples are presented by sampling area. Physical descriptions of samples are presented in Table 7. A summary of all available MFLBC results for Mirex, TOC, and percent fines is presented in Table 1.

In Area 2, Mirex was detected in nine of ten soil samples analyzed. Concentrations ranged from not detected to 2,870 μg/kg, with a mean concentration of 317 μg/kg. Photomirex, detected in two of the soil samples analyzed, was reported at concentrations ranging from

not detected to 4.64 µg/kg, with a mean concentration of 1 µg/kg. Kepone was not detected in Area 2 soil samples. TOC in Area 2 soil samples ranged from 13,000 mg-C/kg soil to 51,000 mg-C/kg soil. Percent fines ranged from 42% to 82%.

Mirex was detected in three of three Area 2 sediment samples at concentrations ranging from an estimated of 179 µg/kg to 1,190 µg/kg, with a mean concentration of 520 µg/kg. Photomirex and Kepone were not detected in Area 2 sediments. Total Organic Carbon in Area 2 sediments ranged from 1,400 mg-C/kg to 4,500 mg-C/kg. Percent fines ranged from approximately 2% to approximately 10%.

In Alternate Area 3, Mirex was detected in fourteen of fifteen soil samples. Reported concentrations ranged from not detected to an estimated maximum concentration of 407 µg/kg, with a mean concentration of 68 µg/kg. Photomirex was detected in five of the fifteen soil samples. Concentrations ranged from not detected to an estimated maximum concentration of 11.7 µg/kg, with a mean concentration of 1.7 µg/kg. Kepone was not detected in soil samples in Alternate Area 3. TOC ranged from 10,000 mg-C/kg to 53,000 mg-C/kg soil. Percent fines ranged from 70% to 88%.

Mirex was detected in five of five Alternate Area 3 sediment samples at concentrations ranging from 11.9 µg/kg to an estimated maximum concentration of 37.9 µg/kg, with a mean concentration of 24.7 µg/kg. Photomirex was detected in only one sediment sample in Alternate Area 3 at a concentration of 1 µg/kg. Kepone was not detected in Alternate Area 3 sediment samples. TOC in Alternate Area 3 sediments ranged from 1,000 mg-C/kg to 13,000 mg-C/kg. Percent fines ranged from approximately 5% to approximately 10%.

In Area 5, Mirex was detected in eighteen of twenty soil samples at concentrations ranging from not detected to an estimated maximum concentration of 2,600 µg/kg, with a mean concentration of 649 µg/kg. Photomirex was detected in thirteen of the twenty soil samples. Concentrations ranged from not detected to 115 µg/kg, with a mean concentration

of 24.8 µg/kg. Kepone was not detected in soil samples from Area 5. TOC ranged from 9,200 mg-C/kg soil to 110,000 mg-C/kg soil. Percent fines ranged from 13 to 94%. Most results were between 37% and 94%.

Mirex was detected in three of three Area 5 sediment samples at concentrations ranging from 32.2 µg/kg to an estimated maximum concentration of 223 µg/kg, with a mean concentration of 131 µg/kg. Photomirex was detected in only one of the three sediment samples at an estimated concentration of 1.6 µg/kg. Kepone was not detected in Area 5 sediment samples. TOC in Area 5 sediments ranged from 9,000 to 40,000 mg-C/kg. Percent fines ranged from approximately 25% to approximately 40%.

Overall, the highest Mirex concentrations in each sampling area occur in floodplain soils as opposed to stream sediments. In soil samples collected during Phase II, Mirex was reported at concentrations ranging from not detected to 2,870 µg/kg, with a mean concentration of 575 µg/kg. Photomirex was reported at concentrations ranging from not detected to a maximum of 115 µg/kg, with a mean concentration of 18.8 µg/kg, and Kepone was not detected. TOC ranged from 9,200 mg-C/kg to 110,000 mg-C/kg in soil. Percent fines ranged from 13 % to 94 %. In sediment samples collected during Phase II, Mirex was reported at concentrations ranging from 11.9 µg/kg to 1,190 µg/kg, with a mean concentration of 189 µg/kg. Photomirex was reported at concentrations ranging from not detected to an estimated maximum concentration of 1.6 µg/kg, with a mean concentration of 0.2 µg/kg. Kepone was not detected. TOC ranged from 1,000 mg-C/kg to 40,000 mg-C/kg in sediment. Percent fines ranged from 2% to 40%.

2.2.3 Egypt Swamp Sampling Program

As described in Section 1, the Agencies' comments on the 1993 Revised RI included a request that additional sampling should be performed at Egypt Swamp. In late November and early December of 1993, ENVIRON, in cooperation with USEPA and OEPA personnel, collected nine composite and eight discrete floodplain soil samples from along

the five-mile stretch of the MFLBC known as Egypt Swamp. Figure 1 shows the location of Egypt Swamp in reference to the Site and other sample areas, while Figure 4 of this Appendix shows a detailed map of the Egypt Swamp Area and the locations of all samples collected. Results of the study were reported to the Agencies in a report "Supplemental Wetland Soil/Sediment Sampling of Egypt Swamp at the Nease Chemical Superfund Site, Salem, Ohio" (Supplemental Wetland Soil/Sediment Sampling Report, ENVIRON, 1994b) which was submitted in March 1994, and is included herein as Attachment N3.

Samples were analyzed for TCL SVOCs, TCL pesticides and Polychlorinated biphenyls (PCBs), MPK, TOC, and GS. Two discrete samples were analyzed for TCL volatiles. One composite sample and one discrete sample also were analyzed for Target Analyte List (TAL) metals and cyanide.

Table 16 of this Appendix summarizes the 1991 RI sampling results in Egypt Swamp. Eight discrete floodplain soil samples and eight discrete sediment samples from MFLBC were collected and analyzed for MPK. Mirex in floodplain soils ranged from not detected to 52 µg/kg, with a mean concentration of 12.7 µg/kg. Photomirex and Kepone were not detected in any of the floodplain soil samples. Mirex in sediments ranged from not detected to 403 µg/kg, with a mean concentration of 126 µg/kg. Photomirex was not detected in six of eight 1991 Egypt Swamp sediment samples. The maximum detected concentration of Photomirex in sediment was 2.96 µg/kg, with a mean concentration of 0.4 µg/kg. Kepone was not detected in sediment samples.

Table 17 of this Appendix summarizes the MPK data for the 1993 Egypt Swamp sampling program. Eight discrete and nine composite samples were collected. Mirex was detected in all seventeen samples at concentrations ranging from an estimated value of 2.9 µg/kg to 4080 µg/kg, with a mean concentration of 357 µg/kg. Photomirex was detected in eight samples. Reported concentrations ranged from not detected to 49.1 µg/kg, with a mean concentration of 4.1 µg/kg. Kepone was detected in three samples. Reported concentrations

ranged from not detected to an estimated value of 56.3 µg/kg, with a mean concentration of 3.9 µg/kg.

One VOC considered to be potentially Site-related was detected in the composite soil sample analyzed. 1,1,2,2-Tetrachloroethane was detected at an estimated concentration of 7 µg/kg. VOCs were not detected in the soil sample analyzed.

In the 1993 soil samples analyzed for SVOCs, twenty-one constituents were detected. Seventeen of the detected SVOCs were PAHs, and most results were estimated values. Six other constituents were detected: Phenol, Dibenzofuran, Diethylphthalate, Carbazole, Di-n-octylphthalate, and Butylbenzylpththalate. Phenol was reported at concentrations ranging from not detected to an estimated maximum concentration of 80 µg/kg. Dibenzofuran was reported at concentrations ranging from not detected to an estimated maximum concentration of 240 µg/kg. Diethylphthalate was detected once at an estimated concentration of 83 µg/kg. Carbazole was reported at concentrations ranging from not detected to an estimated maximum concentration of 660 µg/kg. Di-n-octylphthalate was detected once at an estimated concentration of 66 µg/kg, and Butylbenzylphthalate was detected once at an estimated concentration of 77 µg/kg.

Eleven pesticides were detected in soil samples analyzed for TCL pesticides and PCBs. All of the eleven compounds detected are likely to be from sources other than the Site.

The TOC content of the Egypt Swamp composite and discrete samples (Table 18 of this Appendix) ranged from 36,000 mg-C/kg to 492,000 mg-C/kg.

In samples analyzed for metals, eighteen metals were detected above Contract Required Detection Limits (CRDLs) in the composite sample, and seventeen metals were detected above CRDLs in the discrete sample. Cyanide was not detected in either sample.

2.3 Phase III Sampling Program

As noted in Section 1, in a letter dated March 21, 1995, the Agencies requested additional sampling of the MFLBC and defined the goals of the Phase III sampling program such that selection of sample locations would address data gaps within specified reaches of the MFLBC and focus on areas of potential human health or ecological risk. The Agencies also requested that sampling of sediments for metals analysis be performed.

Two reaches of the MFLBC were identified in the Partial RI as areas needing further study. The identified reaches were between RI Stations 5 and 15 and between RI Stations 19 and 31. To fill these spatial and analytical data gaps, ten transects perpendicular to the creek were selected along these two reaches (see Figure 1). Insets on Figures 2 through 5 show details of Phase III floodplain soil transects and co-located sediment sample locations.

To focus on areas of potential risk to human health, it was assumed that exposure could occur at any accessible location within the floodplain. Therefore, along each floodplain transect, soil sample locations were selected on both sides of the MFLBC at intervals of 50 feet, and, when possible, 250 feet from the creek. As a result of this locating strategy, three locations were selected along each of eight transects, and at transects SS95-12 and SS95-23, four locations were selected along each transect.

To focus on areas of potential ecological risk, floodplain soil transects and associated sediment samples were located in the preferred habitats associated with indicator species that characterize the range of sensitive wildlife receptors potentially using the MFLBC. These species and their preferred habitats are detailed in Table 8 of this Appendix. Table 9 presents the habitats and associated wildlife indicator species corresponding to each sample location. The MFLBC sampling transects encompass a range of habitats for the

wildlife indicator species identified in the Draft Endangerment Assessment, as indicated in Table 10.

As a general strategy, Phase III floodplain soil transects were co-located with existing (Phase I or Phase II) sediment sample locations. Exceptions are transects SS95-08A, SS95-08B, SS95-10, and SS95-12. These four Phase III transects were located in areas not previously sampled, and were co-located with Phase III in-stream sediment samples that were positioned based on the presence of depositional areas within the streambed. These floodplain soil and co-located sediment samples were collected for MPK, TOC, and GS analyses. Along transects SS95-08A, SS95-10, and SS95-12, samples were also collected for SVOC analyses.

Phase III samples were identified by the prefix SS95, for floodplain soil, or SD95 for sediment, followed by the transect number and, for floodplain soil samples, a suffix (01 through 04) to distinguish each location along the transect.

Eleven additional locations were also selected for collection of sediment to be analyzed for TAL metals. Sediment samples selected for metals analysis only were identified by the prefix SD95, followed by an M indicating metals analysis, and a suffix (1 through 11) to distinguish the sample location number (Figure 14).

2.3.1 Phase III Sampling Activities

Exact floodplain soil and sediment sample locations were determined in the field, based on the considerations discussed above. Floodplain soil samples were collected on or near the transect line in the floodplain (loosely defined as being within ten vertical feet of the stream surface) and from material of apparent natural origin that was not submerged. Sediment samples were collected on or near the transect line in depositional areas that were composed of relatively fine-grained materials. If sediments along a transect line

were found to be mainly coarse-grained, other locations in the vicinity were assessed until a more fine-grained material was identified, from which the sample was collected.

During the sampling event, one floodplain soil sample location, SS95-14-01, was moved approximately twenty-five feet along the transect to a wetland depression because its original location was determined to be outside the floodplain. Agency field personnel participated in the relocation of the sample and agreed with the final location. All co-located sediment samples were collected within 20 feet of the corresponding floodplain transects.

Sampling location decisions were conditioned by the intent to obtain data that was representative of the range of conditions across the floodplain to which a human or ecological receptor might be exposed and the range of conditions in stream sediments. All field decisions relating to sample locations were made in consultation with Agency field personnel.

All sampling equipment was decontaminated prior to each use in accordance with procedures outlined in the Phase III Work Plan. Samples were collected with a three-inch stainless steel bucket auger, placed in a stainless steel bowl and homogenized, then placed in appropriate sample containers. Quality assurance samples, including field duplicates and rinsate blanks, were also collected and analyzed. Filled sample containers were placed on ice in an insulated cooler that was then sealed and shipped by overnight courier or hand delivered to Centre Analytical Laboratories, Inc. (CAL) for analysis. Table 11 of this Appendix presents a summary of samples collected, corresponding laboratory identification numbers, dates sampled, and analyses performed.

During Phase III, Agency field personnel collected split samples for MPK and SVOC analyses at several locations, as summarized in Table 11a.

2.3.2 Analytical Results

Table 12 presents a summary of detected concentrations for Phase III samples. The MFLBC Phase III data validation narrative and analytical results tables are included as Attachment N4, and N5, respectively. It is worth noting that for the MFLBC Phase III sampling program, quantitation limits for Mirex, Photomirex, and Kepone were revised under the direction of the Agencies. For Phase III sampling, the laboratory contracted (CAL) differed from previous sampling events. Therefore, a new MDL study was performed, and new quantification limits were developed. The quantitation limits utilized during MFLBC Phase III were 0.79, 1.83, and 10.7 µg/kg, respectively, compared to quantitation limits of 18.5, 20.4, and 68.0 µg/kg, respectively, used during previous events. A summary of TOC results, along with percent fines results obtained from the GS analyses is shown in Table 13. Physical descriptions of the samples recorded during grain size analyses are provided in Table 14.

SVOCs were detected in five of the ten soil samples analyzed. Eight SVOCs were detected. Of the SVOCs detected, Benzoic acid was detected once at an estimated concentration of 290 µg/kg, and Benzo(a)pyrene was detected once at an estimated concentration of 240 µg/kg. Fluoranthene, detected in four samples, was reported at concentrations ranging from not detected to 470 µg/kg. Pyrene, detected in three samples, was reported at concentrations ranging from not detected to 370 µg/kg.

Four additional SVOCs were detected in two floodplain soil samples. Phenanthrene was reported at concentrations ranging from not detected to an estimated maximum concentration of 330 µg/kg. Benzo(a)anthracene was reported at concentrations ranging from not detected to an estimated maximum concentration of 210 µg/kg. Chrysene was reported at concentrations ranging from not detected to an estimated maximum concentration of 250 µg/kg, and Benzo(b)fluoranthene was reported at concentrations ranging from not detected to an estimated maximum concentration of 360 µg/kg. With

the exception of Benzoic acid, SVOCs detected are PAHs, which are not associated with the Site.

Thirty-two MFLBC Phase III floodplain soil samples were analyzed for MPK. Mirex was detected in twenty-three of thirty-two soil samples at concentrations ranging from not detected to 350 µg/kg, with a mean concentration of 106 µg/kg. Photomirex, detected in sixteen of thirty-two soil samples, was reported at concentrations ranging from not detected to 212 µg/kg, with a mean concentration of 26 µg/kg. Kepone was detected in thirteen of thirty-two soil samples at concentrations ranging from not detected to 193 µg/kg, with a mean concentration of 36 µg/kg.

TOC in Phase III floodplain soil samples was reported at concentrations ranging from 600 mg-C/kg soil to 14,600 mg-C/kg soil. Percent fines in floodplain soil samples ranged from 12% to 94%.

SVOCs were not detected in the three MFLBC Phase III sediment samples analyzed. Mirex was detected in two of the four sediment samples analyzed. Reported concentrations ranged from not detected to 344 µg/kg, with a mean concentration of 155 µg/kg. Photomirex and Kepone were not detected in any of the MFLBC Phase III sediment samples. TOC results for MFLBC Phase III sediment samples ranged from 600 mg-C/kg to 2,000 mg-C/kg. Percent fines ranged from 6% to 11%.

Eleven Phase III sediment samples were collected specifically for metals analyses. Results of these analyses are summarized below and in Table 12b of this Appendix.

Selenium was detected at concentrations above the USEPA CRDL in two samples. Cobalt was detected at concentrations above the CRDL in four samples. The other twenty metals analyzed were detected above CRDLs in all eleven samples.

The maximum concentrations of 19 of the 22 metals detected were reported in samples SD95-M-2, SD95-M-3, and SD95-M-4, which are located upstream from the Site. Three metals, iron, silver, and sodium, were detected at maximum concentrations in sediment samples SD95-M-6, SD95-M-10, and SD95-M-9, respectively.

Iron was detected at concentrations ranging from 7,255 mg/kg to 20,517 mg/kg, which is within the range of concentrations detected in background soils in Ohio (Cox and Colvin, 1995). The maximum detected concentration of iron is also below the maximum background concentration of 30,000 mg/kg iron for U.S. soils (Shacklette and Boerngen, 1984). Silver was reported at concentrations ranging from not detected (in seven samples) to an estimated maximum concentration of 0.31 mg/kg, which is within the range of concentrations in background soils in Ohio (Cox and Colvin, 1995).

Sodium was detected at concentrations ranging from 50 µg/kg to an estimated maximum concentration of 328 mg/kg, which is an order of magnitude below the maximum background concentration of 7,000 mg/kg sodium for U.S. soils (Shacklette and Boerngen, 1984). No separate range of concentrations for sodium is identified in the literature for the state of Ohio.

In summary, maximum concentrations for twenty metals were detected in background sediment samples. Maximum concentrations of iron, silver, and sodium were detected in samples collected downstream from the Site, but at concentrations within or below background concentrations.

2.3.3 Habitat Descriptions

During Phase III, at each sample location, the habitat observed in the vicinity of the location was described in field notes. These descriptions, presented in Table 15, begin with the farthest upstream Phase III sample location, SD95-M-1, and continue downstream through the floodplain soil transects and associated samples (including the

two metals samples co-located with transects), to the farthest downstream Phase III transect SS95-26B.

For the discrete sediment samples SD95-M-1 through SD95-M-9, the geographic location is described and the habitat, beginning with the creek itself, moving to the banks, and ending on the floodplains. Any wildlife observed is noted and any impact to or disruption of the habitat in the vicinity of the sample locations is described.

For the floodplain soil samples along transects and sediment samples co-located with those transects , the geographic location is described, and the general habitat of the entire transect is described, beginning with the creek, moving to the banks and concluding with the floodplain. Following the general description of the each transect, the soil sampled is indicated; and the habitat in the vicinity of each sample location along the transect is described. Any wildlife observed is noted, and any impact to or disruption of the habitat in the vicinity of the sample location is described.

3.0 INDIANA BAT SURVEY

In 1992, Ruetgers-Nease Corporation submitted a draft Endangerment Assessment Report to the Agencies. In subsequent comments, the Agencies suggested that the MFLBC was within the general geographic range of the federally endangered Indiana bat (*Myotis sodalis*) and that the species should be addressed in the revised ecological risk assessment. The revised RI and Endangerment Assessment, submitted in July 1993, recommended that the MFLBC be surveyed for habitat that could be potentially suitable to the bat. There are no available data to confirm the current or historical use of MFLBC by the Indiana bat and the survey was not designed to provide that information. The survey, which was conducted in October 1993, was intended to confirm or discount the presence of potentially suitable habitat for the Indiana bat. Full details of the study and the results obtained were reported to the Agencies in February 1994 (ENVIRON, 1994a) and are included here as Attachment N1.

While there are no available data to explicitly confirm the use of MFLBC by the Indiana bat, the habitat suitability evaluation confirmed the presence of potentially suitable habitat in the study area. Much of the 31-mile stretch of MFLBC that was surveyed did exhibit characteristics consistent with the foraging and nursery habitat reported in the literature for the Indiana bat. Exceptions included an area upstream of State Route 45 (Reach 2) and the Franklin Square area (Reach 4) where stream canopy cover was lacking, and below State Route 30 near the town of Lisbon (Reach 7) where the area is industrialized. In addition, six of the eleven MFLBC tributaries that were surveyed exhibited suitable characteristics to consider them as potential Indiana bat habitat. The OEPA benthic macroinvertebrate data suggest that the MFLBC could potentially provide a base of emergent insect prey if, in fact, the Indiana bat was to inhabit this area.

The survey results are qualitative; Figure 1 of Attachment N1 depicts areas along MFLBC that could be considered either potentially suitable or unsuitable habitat.

Quantification of the areal extent of potential habitat was not the objective of the survey, nor can the results be used to infer such (i.e., the hatched areas on the map represent distance along the length of MFLBC but not the distance perpendicular to the stream channel).

As follow up, in an attempt to address the question of whether the Indiana bat is using the habitat adjacent to MFLBC, ENVIRON contacted Ohio and Pennsylvania agencies to determine if there have been reported sightings of the bat in the counties surrounding Columbiana and Mahoning Counties in Ohio. The 1993 EA reported that the Ohio Department of Natural Resources (ODNR) Natural Heritage Data Services did not list the Indiana bat as having been sighted in Columbiana and Mahoning Counties where the Site is located. The results of the contacts made in February 1994 are as follows:

- Contact: Debra Woischke, ODNR, Division of Natural Areas and Preserves. At ENVIRON's request, ODNR files were reviewed for records of Indiana bat sightings in Columbiana, Mahoning, and surrounding Ohio counties. The nearest reported sightings are in Hocking County in southcentral Ohio (over 100 miles from the MFLBC study area). The most concentrated sightings have been in southwest Ohio.

- Contact: Gerry Haffinger, Pennsylvania Game Commission. Mr. Haffinger was unaware of any sightings of the Indiana bat in the Western Pennsylvania counties of Mercer, Lawrence, Beaver, or Washington within the past ten years. He suggested contacting Pennsylvania Natural Diversity Inventory (PNDI) for a review of historical sightings.

- Contact: Kathy McCenna, PNDI. Ms. McCenna reviewed the Natural Heritage database and distribution maps and found no historical sightings of the Indiana bat in Mercer, Lawrence, Beaver, and Washington counties.

Finally, the "Recovery Plan for the Indiana Bat" (U.S. Fish and Wildlife Service, 1983) does not identify any "critical habitats" for the Indiana bat in Ohio. Although the Recovery Plan map of "Known and Suspected Range of Indiana Bat" shades the entire state of Ohio, the available published studies (e.g., Hall 1962) identify only areas in southern and central Ohio where these Bats have been sighted historically. The outer boundary of the range

appears, therefore, to be drawn somewhat arbitrarily and should not be used to establish the presence or use by the Indiana bat in non-critical areas.

In conclusion, based on the available information, although there is potentially suitable foraging and nesting habitat in the MFLBC study area, the available information indicates that it is possible, but not probable that the Indiana bat inhabits this part of Ohio.

4.0 ECOLOGICAL HABITAT INVENTORY AND STREAM SURVEY

The Ecological Habitat Inventory and Stream Survey was conducted over the period October 15-26, 1993, and comprised a field survey of habitats and biota along the MFLBC from the Nease Site to the confluence of the West Fork of Little Beaver Creek with the MFLBC. The study area was divided into 18 stream stretches based on road crossings. The physical habitat of the stream was described at 92 "stream survey points" and the dominant vegetation was described at 196 "habitat description points" along the MFLBC. Major habitat types and vegetation were noted on study area maps. Wetlands were compared to National Wetland Inventory maps, and the present extent of wetlands were shaded on the study area maps. An accompanying list was compiled for birds, mammals, reptiles, and amphibians that were observed during the survey. The full report of the survey is included as Attachment N2.

There were two primary goals for the survey. The first was to provide a more comprehensive description of the dominant physical and vegetative features of the study area (e.g., location and types of wetlands, dominant vegetation, and depositional areas in the stream). At the request of the Agencies, maps have been subsequently prepared which include both the MFLBC habitats and the chemical monitoring data. Figures 2 through 7 of this report present the approximate extent of wetlands adjacent to the MFLBC, habitat description points and stream survey points, and chemical monitoring data.

The second goal of the survey was to record the presence of animals observed in the study area. The list of observed species could then be compared to the lists of species potentially inhabiting the study area based on published literature.

Attachment N2 includes tables of observed species which identify several wildlife species that were observed during the survey but were not anticipated from the published

literature, including the great egret, the common pintail, the white-throated sparrow, the yellow-rumped warbler, and the river otter. In previous draft risk assessment analyses undertaken in 1993, these observed species were represented by receptor species which included the heron, kingfisher, sora, rail, robin, harrier, fox and mink. Five of the receptor species were observed during the field survey, however, no threatened or endangered species were observed.

5.0 CONCLUSIONS

In this Appendix, the results of various studies and sampling programs performed along the MFLBC are summarized. Taking into account all of the available data collected upstream from Lisbon Dam (124 samples), Mirex concentrations in floodplain soils range from non-detect to 6650 µg/kg, with a mean of 317 µg/kg. Mirex concentrations in sediment (70 samples) range from non-detect to an estimated value of 2,820 µg/kg, with a mean of 198 µg/kg. The highest Mirex concentrations in each area occur in floodplain soils as opposed to stream sediments.

Based on Mirex results from the five locations in Area 2 where samples were recovered from different depth intervals during the Area 2 and Phase II sampling programs, Mirex concentrations were found to be highest in surface soils. Overall, Mirex concentrations in floodplain soil and sediment samples collected along the MFLBC are highest in the reach of MFLBC between RI Stations 09 and 14.

Photomirex, a degradation product of Mirex, was detected in 66 of 116 soil samples analyzed and 9 of 56 sediment samples analyzed. In all cases, Photomirex was detected at much lower levels than Mirex in the corresponding samples; in almost all cases, Photomirex levels were an order of magnitude lower than the corresponding Mirex levels. Kepone was detected in 13 of 105 soil samples at concentrations ranging up to 193 µg/kg.

During Phase III, eleven sediment samples were collected for metals analyses. Maximum concentrations for twenty of the twenty-three metals analyzed were detected in sediment samples at locations upstream from the Site. The maximum concentrations of the remaining three metals, iron, silver, and sodium, were detected in samples collected downstream from the Site, but at concentrations within or below background concentrations.

Analysis of VOCs in soils indicated the presence of only one compound that may be Site-related, 1,1,2,2-Tetrachloroethane, reported once at an estimated concentration of 7 µg/kg. Analyses of VOCs in sediments indicated the presence of only three compounds that may be Site-related. 1,2-Dichloroethane was detected once at an estimated concentration of 2 µg/kg. 1,2-Dichloropropane was detected once at a concentration of 18 µg/kg, and 2-Butanone was detected once at an estimated concentration of 10 µg/kg.

Analyses of SVOCs in soils indicated the presence of six compounds that may be Site-related: Phenol, Dibenzofuran, Diethylphthalate, Carbazole, Di-n-octylphthalate, and Butylbenzylpththalate. Phenol was reported at concentrations ranging from not detected to an estimated maximum concentration of 80 µg/kg. Dibenzofuran was reported at concentrations ranging from not detected to an estimated maximum concentration of 240 µg/kg. Diethylphthalate was detected once at an estimated concentration of 83 µg/kg. Carbazole was reported at concentrations ranging from not detected to an estimated maximum concentration of 660 µg/kg. Di-n-octylphthalate was detected once at an estimated concentration of 66 µg/kg, and Butylbenzylphthalate was detected once at an estimated concentration of 77 µg/kg.

Analyses of SVOCs in sediments indicated the presence of only three compounds that may be Site-related: Benzoic acid, Di-n-butylphthalate, and Diphenyl sulfone. Concentrations of Benzoic acid ranged from not detected to an estimated concentration of 430 µg/kg. Reported concentrations of Di-n-butylphthalate ranged from not detected to 74 µg/kg, and reported concentrations of Diphenyl sulfone ranged from not detected to 170 µg/kg.

Analyses of pesticides in soils indicated the presence of eleven compounds. All of the eleven compounds are considered to be from sources other than the Site. Pesticides were not detected in sediments.

The Indiana Bat Habitat Survey determined that although no available data exists to explicitly confirm the use of the MFLBC by the Indiana bat, potentially suitable habitat exists in the area. Further research on sighting information indicated that the Indiana bat has not been sighted in the area and published studies examined do not identify the MFLBC as being part of the Indiana Bat's habitat range. Based on the available information, although there is potentially suitable foraging and nesting habitat in the MFLBC area, the Indiana bat should not be considered as a receptor species.

The Habitat Inventory and Stream Survey performed in 1993 indicated that appropriate receptor species were selected in the 1993 EA for consideration of potential dietary exposures and for completion of an analysis of potential risks from Mirex and Photomirex.

REFERENCES

Cox, C.A. and Colvin G.H., 1995. Investigation of Background Metal Concentrations in Ohio Soils. Cox-Colvin Associates, Hillard, Ohio, (Draft Report, March 1995)

Gilbert, R.O., 1987, Statistical Methods for Environmental Pollution Monitoring, Van Nostrand-Reinhold, New York.

Eastern States Environmental Associates Inc., November 17, 1993, Ecological Habitat Inventory and Stream Survey Report, Prepared for ENVIRON Corporation for Nease Site, Salem, Ohio, Volume I and II.

ERM - Midwest, 1994, MFLBC Statistical Analysis Report, submitted to Ruetgers-Nease Corporation.

ENVIRON Corporation, 1994a, Indiana Bat Habitat Survey: Middle Fork Little Beaver Creek, Salem, Ohio, submitted to USEPA and Ohio EPA (for Ruetgers-Nease Corporation) on February 1, 1994.

ENVIRON Corporation, 1994b, Supplemental Wetland Soil/Sediment Sampling of Egypt Swamp at the Nease Chemical Superfund Site, Salem, Ohio, submitted to USEPA and Ohio EPA (for Ruetgers-Nease Corporation) on March 17, 1994.

Environmental Standards, Inc., 1989, Quality Assurance Review, Ruetgers-Nease Chemical Company, submitted to Ruetgers-Nease Corporation, January 27, 1989.

Hall, J.S., 1962, Life History and Taxonomic Study of the Indiana Bat, *Myotis sidalis,* Scientific Publication #12, Reading Public Museum and Art Gallery, Reading, Pennsylvania.

Ruetgers-Nease Corporation, 1993, Revised RI, submitted to Agencies July 6, 1993.

Ruetgers-Nease Corporation, 1996, Final RI, submitted to Agencies January 31, 1996.

Shacklette, H.T. and Boerngen, J.G. 1984. *Element Concentrations in Soils and Other Surficial Materials of the Conterminous United States.* U.S. Geological Survey Professional Paper 1270, Washington.

U.S. Fish and Wildlife Service, 1983, Recovery Plan for the Indiana Bat, Rockville, Maryland.

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REMEDIAL INVESTIGATION REPORT
NEASE SITE, SALEM, OHIO

VOLUME 5- Appendix N:

Middle Fork of Little Beaver Creek
(Binder 1 of 3)

Submitted to:

U.S. Environmental Protection Agency
Region 5
Chicago, Illinois

and

Ohio Environmental Protection Agency
Columbus, Ohio

Submitted by:

Ruetgers-Nease Corporation
State College, Pennsylvania

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May 1996

Project No. 933-6154

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May 24, 1995

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RE: NEASE SITE, SALEM, OHIO
REMEDIAL INVESTIGATION REPORT: VOLUME 5
APPENDIX N: MIDDLE FORK OF LITTLE BEAVER CREEK

Dear Sheila and Joe:

On behalf of Ruetgers-Nease Corporation (RNC), Golder Associates Inc. (Golder) is pleased to forward herewith the Remedial Investigation Report Appendix N: Middle Fork of Little Beaver Creek for the Nease Site, Salem, Ohio. Additionally, please find a Response to Comments Document addressing general and specific comments on the Additional RI Report (MFLBC Investigations) submitted to the Agencies on August 18, 1994 and commented on the Agencies' letter dated February 24, 1995.

Pursuant to a teleconference call on April 3, 1996 and a meeting on April 24, 1996 between the Agencies, RNC and Golder, this report brings together the results of all RI related activities conducted at the Middle Fork of Little Beaver Creek. The main text, tables, and figures summarize all of the data collected in the various studies. Detailed reports of individual studies (which have been previously submitted to the Agencies) are also included as attachments.

If you have any questions, please call Mr. Ralph Pearce of RNC in the first instance.

Very truly yours,

GOLDER ASSOCIATES INC.

Todd H. Rees, Ph.D.
Project Manager

Elizabeth Duvall
Environmental Scientist

P. Stephen Finn, C.Eng.
Project Director and Principal

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1.0 INTRODUCTION

Pursuant to an Administrative Order of Consent (AOC) effective February 18, 1988, Ruetgers-Nease Corporation (RNC) performed an investigation of the Middle Fork of Little Beaver Creek (MFLBC) in 1990, including sampling and analysis of surface water, sediment, floodplain soil, and fish tissue from stations along the MFLBC and several of its tributaries. The investigation was conducted in accordance with the approved Remedial Investigation (RI) Work Plan (Revision 4) submitted by RNC on February 28, 1990. The results of the 1990 MFLBC investigations were presented in the Partial RI Report dated April 5, 1991 (and summarized herein in Section 2.1), and were used in conjunction with the results of the U.S. Environmental Protection Agency (USEPA)/Ohio Environmental Protection Agency (OEPA) sampling program performed in August and November 1987 and the OEPA survey of the MFLBC performed in 1985 to determine the need for, and locations of, additional samples downstream from the Nease Chemical Site (Site). The Report of April 5, 1991 was considered to be a partial product because it did not include a remedial investigation or endangerment assessment for the RNC manufacturing site (on-Site areas). The report also contained several data gaps regarding the characterization of contamination in the creek sediments and floodplain soils, and the general characterization and assessment of impacts to the ecological units within the creek itself, creek corridors and Egypt Swamp (off-Site areas).

Pursuant to the additional work provisions of Paragraph XIII of the AOC, RNC recommended in the April 5, 1991, Partial RI Report submittal that further investigations be performed on the MFLBC. A MFLBC Phase II program was developed to sample and analyze stream sediments and overbank deposits in the two particular sections of the creek identified in the 1991 Partial RI (from Station 5 to Station 15 and from Station 19 to Station 30, see Figure 1). The primary goal was to characterize mirex distribution in MFLBC floodplain deposits and sediments in the two sections of the creek. RNC submitted to USEPA and OEPA (the Agencies) a MFLBC Phase II Sampling Plan consistent with these

objectives on October 2, 1992. The Sampling Plan was subsequently revised following USEPA/OEPA correspondence dated January 14, and January 28, 1993, and resubmitted on February 4, 1993. USEPA and OEPA (the Agencies) approved the revised MFLBC Phase II Sampling Plan in a letter dated May 8, 1993.

The MFLBC Phase II fieldwork was conducted by ERM-Midwest (ERM) in May 1993. The results of this Phase II sampling are summarized in Section 2.2 of this Appendix. Subsequent to completion of Phase II sampling,ERM prepared statistical analyses of the data and submitted a Statistical Analysis Report to RNC in March 1994. Phase II data, along with ERM's Statistical Analysis Report and a conceptual model for mirex distribution along the MFLBC were provided to the Agencies in the Additional Remedial Investigation Report, MFLBC, Nease Site, Salem, Ohio (Additional RI, Golder Associates, 1994) which was submitted on August 18, 1994. Upon reviewing the Statistical Analysis Report and proposed conceptual model for mirex distribution, the Agencies determined that the statistical relationships and conceptual model were too tenuous of a basis for remedial decision-making. In July 1993, RNC submitted a revised RI Report (Revised RI, RNC, 1993) and Endangerment Assessment (EA) addressing Agency comments on the 1991 Partial RI Report. This report was to be comprehensive, integrating the previous 1990 investigations of the MFLBC (Phase I) together with the more recent studies which characterized the nature and extent of contamination at the Site itself, and Phase II of the MFLBC sampling activities which characterized Mirex, Photomirex, andKepone (MPK) contamination of the creek sediments and surrounding floodplains. However, at the time of the Revised RI's submission, the Phase II data was still being evaluated by ERM. After a preliminary review of the July 1993 Revised RI, the Agencies noted data gaps that had not previously been addressed by RNC and subsequently requested that three additional fieldwork investigations related to the MFLBC be completed, as follows:

1. A field survey of the MFLBC to assess the presence of habitat potentially suitable for the federally endangered Indiana bat;

2. A field survey of habitat types and biota to provide descriptions of the dominant physical and vegetative features of the MFLBC, its riparian zone, and associated wetlands; and

3. Additional wetland soil and sediment sampling within a discrete portion of the MFLBC, known as Egypt Swamp.

All of these investigations were undertaken during the fall of 1993 and factual reports were subsequently submitted to the Agencies (ENVIRON, 1994a, Eastern States, 1993, and ENVIRON 1994b). The reports are included as Attachments N1, N2, and N3, respectively, to this Appendix and are summarized in Sections 3.0, 4.0, and 2.2.3, respectively, of this Appendix. Tabulated results of these investigationsare also included in this Appendix. Wetland areas and other habitat information identified on the Habitat Inventory and Stream Survey figures (Eastern States, 1993) are also presented on Figures 2 through 10 of this Appendix.

The Agencies provided comments on the Phase II study (Additional RI, Golder Associates, 1994) in a letter dated February 24, 1995. The Agencies stated that a more extensive evaluation of the data was needed and that additional sampling of the MFLBC was necessary. In a letter to RNC dated March 21, 1995, the Agencies defined the following goals for additional floodplain soil and sediment sampling of the MFLBC:

- Address critical data gaps in MFLBC floodplain soils[1] and sediment[1] data in the reaches of the creek between RI Stations 5 and 15, and between 19 and 31.

- Within these two reaches, focus sampling on areas which potentially present human health and ecological risks. Design sampling using selected risk scenarios involving human and ecological receptors. Other areas must be characterized but to a lesser degree.

[1] Sediment is used to refer to substrate within the creek channel which is generally submerged; the term floodplain soil refers to substrate within the floodplain which is not generally submerged

Furthermore, the Agencies also requested that additional sediment samples be collected for metals analyses to determine if Site-related metals are present in sediments.

To fulfill these goals, RNC submitted a Work Plan for Phase III Floodplain Soil and Sediment Sampling of the MFLBC (Phase III Work Plan) in June 1995, that identified ten floodplain transects along which thirty-two discrete soil sample locations were situated. In-stream sediment sample locations were also situated along four of the transects. Eleven additional locations were identified at which sediment samples would be collected for metals analyses only. The Phase III Work Plan was approved by the Agencies on July 5, 1995. On July 31, 1995, with Agency concurrence, the Phase III Work Plan was modified; as a result of difficulties in obtaining an access agreement for a property associated with the original location of transect SS95-26B, the transect was relocated to an area approximately 500 feet south of its original location.

Phase III floodplain soil and sediment sampling of the MFLBC was performed in accordance with the modified Phase III Work Plan in September 1995. Section 2.3 of this Appendix text summarizes the Phase III sampling activities, analytical chemistry results, and sample location habitat descriptions. Figure 1 of this Appendix, the MFLBC schematic sampling map, shows Phase I, II, and III sample locations. Detailed representations of MFLBC sampling locations and associated analytical data for Mirex and Photomirex are shown on Figures 2 through 10 of this report.

The purpose of this appendix to the Final RI Report (Final RI, RNC, 1996) is to provide an integrated presentation of all available results from the various investigations of the MFLBC described above so as to define the nature and extent of Mirex in MFLBC floodplain deposits and sediments. Background information is presented in Section 1.0. Sampling programs and associated results are summarized in Section 2.0. The Indiana bat Habitat Survey is summarized in Section 3.0, and the Ecological Habitat Inventory and Stream Survey is summarized in Section 4.0. Section 5.0 presents an overview of the

Supplemental Wetland Soil/Sediment Sampling Of Egypt Swamp and Section 6.0 summarizes the conclusions of the complete MFLBC RI studies.

2.0 MFLBC FLOODPLAIN SOIL AND SEDIMENT INVESTIGATIONS

As described in Section 1.0, sampling activities associated with the MFLBC were performed in three major phases. These sampling programs are summarized below. The Phase I program is described in Section 2.1. The Area 2 and Phase II programs are described in Section 2.2, and the Phase III program is described in Section 2.3. Table 1 of this Appendix summarizes minimum, maximum, and mean concentrations of Mirex, total organic carbon content (TOC), and percent fines detected during all of the MFLBC sampling events (except the initial 1985 OEPA sampling event, the results of which are unavailable). Figures 2 through 10 present detailed locations for Phase I, II, and III samples, along with Mirex and Photomirex results. In cases where both a primary sample and a field duplicate sample were analyzed for a specific parameter, a conservative approach was taken in that the higher of the two results is reported in all summary tables and figures.

2.1 Phase I Sampling Program

The Phase I sampling was performed in 1990 and involved the collection of twenty-eight overbank (i.e., floodplain) soil samples and fifty-four sediment samples.

During the RI, Phase I samples were identified by the prefix SS91, for overbank deposit soils, or SD91 for sediment, followed by the transect number and, for overbank deposit samples, a suffix (01 through 04) to distinguish each location along the transect. Soil samples were analyzed for Diphenyl sulfone, Methoxychlor, and MPK. Diphenyl sulfone and Methoxychlor were not detected. Mirex was detected in eighteen of twenty-four soil samples. Reported concentrations ranged from not detected to 4540 µg/kg, with a mean concentration of 654 µg/kg. Photomirex was detected in eleven of twenty-four samples. Reported concentrations ranged from not detected to an estimated maximum concentration of 132 µg/kg. The mean concentration of Photomirex in soil was 12 µg/kg. Kepone was not detected in Phase I soil samples (see Table 2).

Sediment samples were analyzed for Target Compound List (TCL) volatile organic compounds (VOCs), TCL semi-volatile organic compounds (SVOCs), TCL pesticides, and MPK. VOCs were detected in five of seven samples. Five specific VOCs were detected, two of which ~~were~~ may be associated with sources other than the Site. The potentially Site-related constituents, 1,2-Dichloroethane, 1,2-Dichloropropane, and 2-Butanone, were detected ~~only~~ each once at low levels (see Table 3).

SVOCs were detected in twenty-seven of thirty-two sediment samples. Twenty-four specific SVOCs were detected. ~~Only three of the detected SVOCs, Benzoic acid, Di-n-butylphthalate, and Diphenyl sulfone, were associated with the Site.~~ Benzoic acid, detected in two samples, was reported at concentrations ranging from not detected to an estimated maximum concentration of 430 µg/kg. Di-n-butylphthalate, detected in three samples, was reported at concentrations ranging from not detected to an estimated maximum concentration of 74 µg/kg. Diphenyl sulfone, detected in two samples, was reported at concentrations ranging from not detected to an estimated maximum concentration of 170 µg/kg (see Table 4). Of the twenty-one detected SVOCs which are likely to be associated with sources other than the Site, sixteen are Polynuclear Aromatic Hydrocarbons (PAHs).

One TCL pesticide, Heptachlor, was detected in one of twenty-one sediment samples at an estimated concentration of 9.4 µg/kg. The compound was detected in a sample collected upstream from Site and is ~~considered to be~~ probably related to sources other than the Site.

Mirex was detected in thirty-six of forty-one sediment samples. Reported concentrations of Mirex ranged from not detected to an estimated maximum concentration of 2820 µg/kg, with a mean concentration of 239 µg/kg. Photomirex was detected in seven of the forty-one sediment samples. Reported concentrations of Photomirex ranged from not detected to an estimated maximum value of 7.38 µg/kg, with a mean concentration of 0.6 µg/kg. Kepone was not detected in Phase I sediment samples (See Table 5).

2.2 Area 2, Phase II, and Egypt Swamp Sampling Programs

In August 1991, OEPA collected soil/sediment samples from the area known as Colonial Villa (CV) mobile home park. This area was subsequently identified as Area 2 and is referred to as such throughout this report. Results are summarized in Section 2.2.1. In May 1993, a second major phase of sampling (Phase II) was performed along the MFLBC by RNC. The Phase II sampling program is described in Section 2.2.2. In November and December 1993, supplemental soil/sediment sampling was performed in the Egypt Swamp in response to Agency requests. This sampling program is summarized in Section 2.2.3 and described in full in the attached document, Supplemental Wetland Soil/Sediment Sampling Of Egypt Swamp At The Nease Chemical Superfund Site, Salem, Ohio (Wetland Soil/Sediment Sampling Report, ENVIRON, 1994b).

2.2.1 Area 2 Sampling Program

In August 1991 fifteen soil samples were collected from Area 2, which is located downstream from the Site on the eastern floodplain of the MFLBC. Samples were analyzed for MPK. Results for Area 2 samples, identified as RNS-SS-09-10 through RNS-SS-09-15 and RNS-SS-09-21 through RNS-SS-09-30, are shown in Table 6 and on Figure 2 of this Appendix.

For Mirex, concentrations ranged from 0.719 µg/kg to an estimated maximum value of 6,650 µg/kg, with a mean concentration of 581 µg/kg. Photomirex was reported at concentrations ranging from 1 µg/kg to a maximum estimated concentration of 104 µg/kg, with a mean concentration of 26 µg/kg. Kepone was not detected.

2.2.2 Phase II Sampling Program

The Phase II sampling program was developed to delineate more extensively the distribution of Mirex along the MFLBC. Mirex concentrations were anticipated to exhibit a dependent relationship with the following variables:

1. Soil/sediment organic carbon content;
2. Soil/sediment grain size;
3. Distance and elevation change from the MFLBC (floodplain soils);and
4. Distance from source.

Such relationships have a strong physical basis derived from the properties of Mirex. Because Mirex is virtually insoluble in water but can be adsorbed to fine grained organic-rich sediments, fate and transport of Mirex within the MFLBC is anticipated to be primarily the result of hydraulic transport of fine grained organic rich sediment. Therefore, Mirex concentrations would be expected to be higher in depositional areas, where sediments and floodplain soils have higher fines content and/or organic content. The lateral distribution of Mirex is expected to be limited by the physics of sediment transport, based on elevation changes across the floodplain, which determine the lateral extent of flooding that occurs during large storm events. After a flood event occurs, the floodwater eventually recedes from the most distant, more elevated areas at first and eventually from areas immediately adjacent to the stream. As a result, areas of the floodplain that are situated closer to the creek, and especially areas that are closer to the creek and sloped more gradually, remain inundated by flowing floodwaters for longer periods than distant areas, and possess greater potential to receive sediments settling from receding floodwater. The flow of the floodwater also decreases as the water recedes, potentially resulting in settlement of sediments. Given these factors, it is expected that samples collected from areas closer to the creek would contain more transported sediment, and therefore potentially higher concentrations of Mirex.

Distribution in the downstream direction is also expected to be limited by the physics of sediment transport, based on stream morphology. Areas of sediment deposition along a stream result from changes in stream morphology. When a relatively shallow streambed

changes from a rough substrate, such as a rocky area (a riffle area) to a smoother substrate (a pool area) and turbulence subsides, particulate matter may no longer be held in suspension and may begin to settle out of the water. When the rate of elevational change in the downstream direction diminishes to a much more horizontal slope, flow may decrease sufficiently to result in sediment deposition. When a streambed distinctly changes direction (i.e., when the stream bends or meanders): the rate of flow in the inner portion of the bend is slower. As a result sediment may be deposited on that inner portion of the streambed. The extent of and frequency of riffle/run areas, pool/depositional areas, and meanders, as well as other morphological attributes of the stream, may therefore limit the transport of sediment (and potentially Mirex bound to sediment) in the downstream direction.

To enable evaluation of the anticipated relationships identified above, Phase II samples were collected from three of the five proposed sampling areas of the MFLBC (see Figure 1) and analyzed for TOC and grain size (GS), as well as for analytical chemistry.

2.2.2.1 Phase II Sampling Activities

The approved MFLBC Phase II Program originally consisted of focused floodplain soil and stream sediment sampling at five selected areas designated Area 1, Area 2, Area 3, Area 4, and Area 5 (see Figure 1 of this Appendix and the Middle Fork Little Beaver Creek Sampling Plan, February 4, 1993, pp. 5-6) downstream from the Site and upstream from Lisbon Dam. However, because access issues in three of the five areas were not able to be resolved by RNC, two areas were dropped from the Phase II Program (Areas 1 and 4) and Area 3 was replaced by Alternate Area 3. In a letter dated May 8, 1993, the Agencies concurred with RNC on the substitution of Alternate Area 3 and encouraged RNC to proceed with the sampling of the three areas while continuing to pursue access for Areas 1 and 4.

Floodplain samples were collected from a depth of 0-6 inches, and sediment (in-stream) samples were collected as a composite of three samples taken within a sediment body. In Area 2, ten floodplain soil samples and three sediment samples were collected. In Alternate Area 3, fifteen floodplain soil samples and five sediment samples were collected. In Area 5, twenty floodplain soil and three sediment samples were collected. Floodplain soil samples were also collected from a depth of 6-12 inches at five locations within Area 2, for vertical profiling of Mirex. Area 2 was selected for this purpose on the basis that samples collected from a depth of 0-6 inches at Area 2 by OEPA in August 1991 had exhibited the highest Mirex levels detected in samples collected from the MFLBC.

Phase II samples were identified by the prefix SS93, for overbank deposit soils, or SD93 for sediment, followed by station number associated with the given area (09 for Area 2, 15 for Alternate Area 3, or 28 for Area 5), and a suffix to distinguish each specific location within the area. All samples were collected using stainless steel utensils (trowels, hand augers, and triers), and were analyzed for MPK, TOC, and GS analyses. Sampling methods were designed to avoid loss of fines from the material, so that an accurate analysis of grain size could be obtained.

Samples also were collected for QA/QC purposes following protocols stated in the Quality Assurance Project Plan (QAPjP) of the RI Work Plan (Volume 2, Q.A.P.P., Section 6.7.1, pp. 89-90). Figures 11, 12, and 13 of this Appendix show the sample points for Area 2, Alternate Area 3, and Area 5, respectively, and the grid system used to select the sample point locations. Sample locations were selected using the unaligned systematic grid procedure of Gilbert (1987). Add Insert A

2.2.2.2 Phase II Analytical Results

Analyses were performed at Midwest Research Institute of Kansas City, Missouri, and validation of the analytical data was performed by Environmental Standards, Inc. of Valley Forge, Pennsylvania.

The Phase II analytical chemistry results, along with TOC and GS results, are presented in Table 6 of this Appendix. In Table 6, results of the grain size analyses are presented as D_{10}, D_{30}, and D_{60} (μm) size fractions (particle sizes below which 10%, 30%, and 60% of soil by weight is composed, respectively). In Table 6A, percent fines and TOC results for Phase II samples are presented by sampling area. Physical descriptions of samples are presented in Table 7. A summary of all available MFLBC results for Mirex, TOC, and percent fines is presented in Table 1.

In Area 2, Mirex was detected in nine of ten soil samples analyzed. Concentrations ranged from not detected to 2,870 μg/kg, with a mean concentration of 317 μg/kg. Photomirex, detected in two of the soil samples analyzed, was reported at concentrations ranging from not detected to 4.64 μg/kg, with a mean concentration of 1 μg/kg. Kepone was not detected in Area 2 soil samples. TOC in Area 2 soil samples ranged from 13,000 mg-C/kg soil to 51,000 mg-C/kg soil. Percent fines ranged from 42% to 82%.

Mirex was detected in three of three Area 2 sediment samples at concentrations ranging from an estimated of 179 μg/kg to 1,190 μg/kg, with a mean concentration of 520 μg/kg. Photomirex and Kepone were not detected in Area 2 sediments. Total Organic Carbon in Area 2 sediments ranged from 1,400 mg-C/kg to 4,500 mg-C/kg. Percent fines ranged from approximately 2% to approximately 10%.

In Alternate Area 3, Mirex was detected in fourteen of fifteen soil samples. Reported concentrations ranged from not detected to an estimated maximum concentration of 407

µg/kg, with a mean concentration of 68 µg/kg. Photomirex was detected in five of the fifteen soil samples. Concentrations ranged from not detected to an estimated maximum concentration of 11.7 µg/kg, with a mean concentration of 1.7 µg/kg. Kepone was not detected in soil samples in Alternate Area 3. TOC ranged from 10,000 mg-C/kg to 53,000 mg-C/kg soil. Percent fines ranged from 70% to 88%.

Mirex was detected in five of five Alternate Area 3 sediment samples at concentrations ranging from 11.9 µg/kg to an estimated maximum concentration of 37.9 µg/kg, with a mean concentration of 24.7 µg/kg. Photomirex was detected in only one sediment sample in Alternate Area 3 at a concentration of 1 µg/kg. Kepone was not detected in Alternate Area 3 sediment samples. TOC in Alternate Area 3 sediments ranged from 1,000 mg-C/kg to 13,000 mg-C/kg. Percent fines ranged from approximately 5% to approximately 10%.

In Area 5, Mirex was detected in eighteen of twenty soil samples at concentrations ranging from not detected to an estimated maximum concentration of 2,600 µg/kg, with a mean concentration of 649 µg/kg. Photomirex was detected in thirteen of the twenty soil samples. Concentrations ranged from not detected to 115 µg/kg, with a mean concentration of 24.8 µg/kg. Kepone was not detected in soil samples from Area 5. TOC ranged from 9,200 mg-C/kg soil to 110,000 mg-C/kg soil. Percent fines ranged from 13 to 94%. Most results were between 37% and 94%.

Mirex was detected in three of three Area 5 sediment samples at concentrations ranging from 32.2 µg/kg to an estimated maximum concentration of 223 µg/kg, with a mean concentration of 131 µg/kg. Photomirex was detected in only one of the three sediment samples at an estimated concentration of 1.6 µg/kg. Kepone was not detected in Area 5 sediment samples. TOC in Area 5 sediments ranged from 9,000 to 40,000 mg-C/kg. Percent fines ranged from approximately 25% to approximately 40%.

Overall, the highest Mirex concentrations in each sampling area occur in floodplain soils as opposed to stream sediments. In soil samples collected during Phase II, Mirex was reported at concentrations ranging from not detected to 2,870 µg/kg, with a mean concentration of 575 µg/kg. Photomirex was reported at concentrations ranging from not detected to a maximum of 115 µg/kg, with a mean concentration of 18.8 µg/kg, and Kepone was not detected. TOC ranged from 9,200 mg-C/kg to 110,000 mg-C/kg in soil. Percent fines ranged from 13 % to 94 %. In sediment samples collected during Phase II, Mirex was reported at concentrations ranging from 11.9 µg/kg to 1,190 µg/kg, with a mean concentration of 189 µg/kg. Photomirex was reported at concentrations ranging from not detected to an estimated maximum concentration of 1.6 µg/kg, with a mean concentration of 0.2 µg/kg. Kepone was not detected. TOC ranged from 1,000 mg-C/kg to 40,000 mg-C/kg in sediment. Percent fines ranged from 2% to 40%.

2.2.3 Egypt Swamp Sampling Program

As described in Section 1, the Agencies' comments on the 1993 Revised RI included a request that additional sampling should be performed at Egypt Swamp. In late November and early December of 1993, ENVIRON, in cooperation with USEPA and OEPA personnel, collected nine composite and eight discrete floodplain soil samples from along the five-mile stretch of the MFLBC known as Egypt Swamp. Figure 1 shows the location of Egypt Swamp in reference to the Site and other sample areas, while Figure 4 of this Appendix shows a detailed map of the Egypt Swamp Area and the locations of all samples collected. Results of the study were reported to the Agencies in a report "Supplemental Wetland Soil/Sediment Sampling of Egypt Swamp at the Nease Chemical Superfund Site, Salem, Ohio" (Supplemental Wetland Soil/Sediment Sampling Report, ENVIRON, 1994b) which was submitted in March 1994, and is included herein as Attachment N3.

Samples were analyzed for TCL SVOCs, TCL pesticides and Polychlorinated biphenyls (PCBs), MPK, TOC, and GS. Two discrete samples were analyzed for TCL volatiles. One

composite sample and one discrete sample also were analyzed for Target Analyte List (TAL) metals and cyanide.

Table 16 of this Appendix summarizes the 1991 RI sampling results in Egypt Swamp. Eight discrete floodplain soil samples and eight discrete sediment samples from MFLBC were collected and analyzed for MPK. Mirex in floodplain soils ranged from not detected to 52 µg/kg, with a mean concentration of 12.7 µg/kg. Photomirex and Kepone were not detected in any of the floodplain soil samples. Mirex in sediments ranged from not detected to 403 µg/kg, with a mean concentration of 126 µg/kg. Photomirex was not detected in six of eight 1991 Egypt Swamp sediment samples. The maximum detected concentration of Photomirex in sediment was 2.96 µg/kg, with a mean concentration of 0.4 µg/kg. Kepone was not detected in sediment samples.

Table 17 of this Appendix summarizes the MPK data for the 1993 Egypt Swamp sampling program. Eight discrete and nine composite samples were collected. Mirex was detected in all seventeen samples at concentrations ranging from an estimated value of 2.9 µg/kg to 4080 µg/kg, with a mean concentration of 357 µg/kg. Photomirex was detected in eight samples. Reported concentrations ranged from not detected to 49.1 µg/kg, with a mean concentration of 4.1 µg/kg. Kepone was detected in three samples. Reported concentrations ranged from not detected to an estimated value of 56.3 µg/kg, with a mean concentration of 3.9 µg/kg.

One VOC considered to be potentially Site-related was detected in the composite soil sample analyzed. 1,1,2,2-Tetrachloroethane was detected at an estimated concentration of 7 µg/kg. VOCs were not detected in the soil sample analyzed.

In the 1993 soil samples analyzed for SVOCs, twenty-one constituents were detected. Seventeen of the detected SVOCs were PAHs, and most results were estimated values. Six other constituents were detected: Phenol, Dibenzofuran, Diethylphthalate, Carbazole, Di-n-

octylphthalate, and Butylbenzylpththalate. Phenol was reported at concentrations ranging from not detected to an estimated maximum concentration of 80 µg/kg. Dibenzofuran was reported at concentrations ranging from not detected to an estimated maximum concentration of 240 µg/kg. Diethylphthalate was detected once at an estimated concentration of 83 µg/kg. Carbazole was reported at concentrations ranging from not detected to an estimated maximum concentration of 660 µg/kg. Di-n-octylphthalate was detected once at an estimated concentration of 66 µg/kg, and Butylbenzylphthalate was detected once at an estimated concentration of 77 µg/kg.

Eleven pesticides were detected in soil samples analyzed for TCL pesticides and PCBs. All of the eleven compounds detected are ~~considered~~ likely to be from sources other than the Site.

The TOC content of the Egypt Swamp composite and discrete samples (Table 18 of this Appendix) ranged from 36,000 mg-C/kg to 492,000 mg-C/kg.

In samples analyzed for metals, eighteen metals were detected above Contract Required Detection Limits (CRDLs) in the composite sample, and seventeen metals were detected above CRDLs in the discrete sample. Cyanide was not detected in either sample.

2.3 Phase III Sampling Program

As noted in Section 1, in a letter dated March 21, 1995, the Agencies requested additional sampling of the MFLBC and defined the goals of the Phase III sampling program such that selection of sample locations would address data gaps within specified reaches of the MFLBC and focus on areas of potential human health or ecological risk. The Agencies also requested that sampling of sediments for metals analysis be performed.

Two reaches of the MFLBC were identified in the Partial RI as areas needing further study. The identified reaches were between RI Stations 5 and 15 and between RI Stations 19 and 31. To fill these spatial and analytical data gaps, ten transects perpendicular to the creek were selected along these two reaches (see Figure 1). Insets on Figures 2 through 5 show details of Phase III floodplain soil transects and co-located sediment sample locations.

To focus on areas of potential risk to human health, it was assumed that exposure could occur at any accessible location within the floodplain. Therefore, along each floodplain transect, soil sample locations were selected on both sides of the MFLBC at intervals of 50 feet, and, when possible, 250 feet from the creek. As a result of this locating strategy, three locations were selected along each of eight transects, and at transects SS95-12 and SS95-23, four locations were selected along each transect.

To focus on areas of potential ecological risk, floodplain soil transects and associated sediment samples were located in the preferred habitats associated with indicator species that characterize the range of sensitive wildlife receptors potentially using the MFLBC. These species and their preferred habitats are detailed in Table 8 of this Appendix. Table 9 presents the habitats and associated wildlife indicator species corresponding to each sample location. The MFLBC sampling transects encompass a range of habitats for the

wildlife indicator species identified in the Draft Endangerment Assessment, as indicated in Table 10.

As a general strategy, Phase III floodplain soil transects were co-located with existing (Phase I or Phase II) sediment sample locations. Exceptions are transects SS95-08A, SS95-08B, SS95-10, and SS95-12. These four Phase III transects were located in areas not previously sampled, and were co-located with Phase III in-stream sediment samples that were positioned based on the presence of depositional areas within the streambed. These floodplain soil and co-located sediment samples were collected for MPK, TOC, and GS analyses. Along transects SS95-08A, SS95-10, and SS95-12, samples were also collected for SVOC analyses.

Phase III samples were identified by the prefix SS95, for floodplain soil, or SD95 for sediment, followed by the transect number and, for floodplain soil samples, a suffix (01 through 04) to distinguish each location along the transect.

Eleven additional locations were also selected for collection of sediment to be analyzed for TAL metals. Sediment samples selected for metals analysis only were identified by the prefix SD95, followed by an M indicating metals analysis, and a suffix (1 through 11) to distinguish the sample location number (Figure 14).

2.3.1 Phase III Sampling Activities

Exact floodplain soil and sediment sample locations were determined in the field, based on the considerations discussed above. Floodplain soil samples were collected on or near the transect line in the floodplain (loosely defined as being within ten vertical feet of the stream surface) and from material of apparent natural origin that was not submerged. Sediment samples were collected on or near the transect line in depositional areas that were composed of relatively fine-grained materials. If sediments along a transect line

were found to be mainly coarse-grained, other locations in the vicinity were assessed until a more fine-grained material was identified, from which the sample was collected.

During the sampling event, one floodplain soil sample location, SS95-14-01, was moved approximately twenty-five feet along the transect to a wetland depression because its original location was determined to be outside the floodplain. Agency field personnel participated in the relocation of the sample and agreed with the final location. All co-located sediment samples were collected within 20 feet of the corresponding floodplain transects.

Sampling location decisions were conditioned by the intent to obtain data that was representative of the range of conditions across the floodplain to which a human or ecological receptor might be exposed and the range of conditions in stream sediments. All field decisions relating to sample locations were made in consultation with Agency field personnel.

All sampling equipment was decontaminated prior to each use in accordance with procedures outlined in the Phase III Work Plan. Samples were collected with a three-inch stainless steel bucket auger, placed in a stainless steel bowl and homogenized, then placed in appropriate sample containers. Quality assurance samples, including field duplicates and rinsate blanks, were also collected and analyzed. Filled sample containers were placed on ice in an insulated cooler that was then sealed and shipped by overnight courier or hand delivered to Centre Analytical Laboratories, Inc. (CAL) for analysis. Table 11 of this Appendix presents a summary of samples collected, corresponding laboratory identification numbers, dates sampled, and analyses performed.

During Phase III, Agency field personnel collected split samples for MPK and SVOC analyses at several locations, as summarized in Table 11a.

2.3.2 Analytical Results

Table 12 presents a summary of detected concentrations for Phase III samples. The MFLBC Phase III data validation narrative and analytical results tables are included as Attachment N4, and N5, respectively. It is worth noting that for the MFLBC Phase III sampling program, quantitation limits for Mirex, Photomirex, and Kepone were revised under the direction of the Agencies. The quantitation limits utilized during MFLBC Phase III were 0.79, 1.83, and 10.7 µg/kg, respectively, compared to quantitation limits of 18.5, 20.4, and 68.0 µg/kg, respectively, used during previous events. A summary of TOC results, along with percent fines results obtained from the GS analyses is shown in Table 13. Physical descriptions of the samples recorded during grain size analyses are provided in Table 14.

SVOCs were detected in five of the ten soil samples analyzed. Eight SVOCs were detected. Of the SVOCs detected, Benzoic acid was detected once at an estimated concentration of 290 µg/kg, and Benzo(a)pyrene was detected once at an estimated concentration of 240 µg/kg. Fluoranthene, detected in four samples, was reported at concentrations ranging from not detected to 470 µg/kg. Pyrene, detected in three samples, was reported at concentrations ranging from not detected to 370 µg/kg.

Four additional SVOCs were detected in two floodplain soil samples. Phenanthrene was reported at concentrations ranging from not detected to an estimated maximum concentration of 330 µg/kg. Benzo(a)anthracene was reported at concentrations ranging from not detected to an estimated maximum concentration of 210 µg/kg. Chrysene was reported at concentrations ranging from not detected to an estimated maximum concentration of 250 µg/kg, and Benzo(b)fluoranthene was reported at concentrations ranging from not detected to an estimated maximum concentration of 360 µg/kg. With the exception of Benzoic acid, SVOCs detected are PAHs, which are not associated with the Site.

Thirty-two MFLBC Phase III floodplain soil samples were analyzed for MPK. Mirex was detected in twenty-three of thirty-two soil samples at concentrations ranging from not detected to 350 µg/kg, with a mean concentration of 106 µg/kg. Photomirex, detected in sixteen of thirty-two soil samples, was reported at concentrations ranging from not detected to 212 µg/kg, with a mean concentration of 26 µg/kg. Kepone was detected in thirteen of thirty-two soil samples at concentrations ranging from not detected to 193 µg/kg, with a mean concentration of 36 µg/kg.

TOC in Phase III floodplain soil samples was reported at concentrations ranging from 600 mg-C/kg soil to 14,600 mg-C/kg soil. Percent fines in floodplain soil samples ranged from 12% to 94%.

SVOCs were not detected in the three MFLBC Phase III sediment samples analyzed. Mirex was detected in two of the four sediment samples analyzed. Reported concentrations ranged from not detected to 344 µg/kg, with a mean concentration of 155 µg/kg. Photomirex and Kepone were not detected in any of the MFLBC Phase III sediment samples. TOC results for MFLBC Phase III sediment samples ranged from 600 mg-C/kg to 2,000 mg-C/kg. Percent fines ranged from 6% to 11%.

Eleven Phase III sediment samples were collected specifically for metals analyses. Results of these analyses are summarized below and in Table 12b of this Appendix.

Selenium was detected at concentrations above the USEPA CRDL in two samples. Cobalt was detected at concentrations above the CRDL in four samples. The other twenty metals analyzed were detected above CRDLs in all eleven samples.

The maximum concentrations of 19 of the 22 metals detected were reported in samples SD95-M-2, SD95-M-3, and SD95-M-4, which are located upstream from the Site. Three

metals, iron, silver, and sodium, were detected at maximum concentrations in sediment samples SD95-M-6, SD95-M-10, and SD95-M-9, respectively.

Iron was detected at concentrations ranging from 7,255 mg/kg to 20,517 mg/kg, which is within the range of concentrations detected in background soils in Ohio (Cox and Colvin, 1995). The maximum detected concentration of iron is also below the maximum background concentration of 30,000 mg/kg iron for U.S. soils (Shacklette and Boerngen, 1984). Silver was reported at concentrations ranging from not detected (in seven samples) to an estimated maximum concentration of 0.31 mg/kg, which is within the range of concentrations in background soils in Ohio (Cox and Colvin, 1995).

Sodium was detected at concentrations ranging from 50 µg/kg to an estimated maximum concentration of 328 mg/kg, which is an order of magnitude below the maximum background concentration of 7,000 mg/kg sodium for U.S. soils (Shacklette and Boerngen, 1984). No separate range of concentrations for sodium is identified in the literature for the state of Ohio.

In summary, maximum concentrations for twenty metals were detected in background sediment samples. Maximum concentrations of iron, silver, and sodium were detected in samples collected downstream from the Site, but at concentrations within or below background concentrations.

2.3.3 Habitat Descriptions

During Phase III, at each sample location, the habitat observed in the vicinity of the location was described in field notes. These descriptions, presented in Table 15, begin with the farthest upstream Phase III sample location, SD95-M-1, and continue downstream through the floodplain soil transects and associated samples (including the

two metals samples co-located with transects), to the farthest downstream Phase III transect SS95-26B.

For the discrete sediment samples SD95-M-1 through SD95-M-9, the geographic location is described and the habitat, beginning with the creek itself, moving to the banks, and ending on the floodplains. Any wildlife observed is noted and any impact to or disruption of the habitat in the vicinity of the sample locations is described.

For the floodplain soil samples along transects and sediment samples co-located with those transects , the geographic location is described, and the general habitat of the entire transect is described, beginning with the creek, moving to the banks and concluding with the floodplain. Following the general description of the each transect, the soil sampled is indicated; and the habitat in the vicinity of each sample location along the transect is described. Any wildlife observed is noted, and any impact to or disruption of the habitat in the vicinity of the sample location is described.

3.0 INDIANA BAT SURVEY

In 1992, Ruetgers-Nease Corporation submitted a draft Endangerment Assessment Report to the Agencies. In subsequent comments, the Agencies suggested that the MFLBC was within the general geographic range of the federally endangered Indiana bat (*Myotis sodalis*) and that the species should be addressed in the revised ecological risk assessment. The revised RI and Endangerment Assessment, submitted in July 1993, recommended that the MFLBC be surveyed for habitat that could be potentially suitable to the bat. There are no available data to confirm the current or historical use of MFLBC by the Indiana bat and the survey was not designed to provide that information. The survey, which was conducted in October 1993, was intended to confirm or discount the presence of potentially suitable habitat for the Indiana bat. Full details of the study and the results obtained were reported to the Agencies in February 1994 (ENVIRON, 1994a) and are included here as Attachment N1.

While there are no available data to explicitly confirm the use of MFLBC by the Indiana bat, the habitat suitability evaluation confirmed the presence of potentially suitable habitat in the study area. Much of the 31-mile stretch of MFLBC that was surveyed did exhibit characteristics consistent with the foraging and nursery habitat reported in the literature for the Indiana bat. Exceptions included an area upstream of State Route 45 (Reach 2) and the Franklin Square area (Reach 4) where stream canopy cover was lacking, and below State Route 30 near the town of Lisbon (Reach 7) where the area is industrialized. In addition, six of the eleven MFLBC tributaries that were surveyed exhibited suitable characteristics to consider them as potential Indiana bat habitat. The OEPA benthic macroinvertebrate data suggest that the MFLBC could potentially provide a base of emergent insect prey if, in fact, the Indiana bat was to inhabit this area.

The survey results are qualitative; Figure 1 of Attachment N1 depicts areas along MFLBC that could be considered either potentially suitable or unsuitable habitat. Quantification of the areal extent of potential habitat was not the objective of the survey, nor can the results be used to infer such (i.e., the hatched areas on the map represent distance along the length of MFLBC but not the distance perpendicular to the stream channel).

As follow up, in an attempt to address the question of whether the Indiana bat is using the habitat adjacent to MFLBC, ENVIRON contacted Ohio and Pennsylvania agencies to determine if there have been reported sightings of the bat in the counties surrounding Columbiana and Mahoning Counties in Ohio. The 1993 EA reported that the Ohio Department of Natural Resources (ODNR) Natural Heritage Data Services did not list the Indiana bat as having been sighted in Columbiana and Mahoning Counties where the Site is located. The results of the contacts made in February 1994 are as follows:

- Contact: Debra Woischke, ODNR, Division of Natural Areas and Preserves. At ENVIRON's request, ODNR files were reviewed for records of Indiana bat sightings in Columbiana, Mahoning, and surrounding Ohio counties. The nearest reported sightings are in Hocking County in southcentral Ohio (over 100 miles from the MFLBC study area). The most concentrated sightings have been in southwest Ohio.

- Contact: Gerry Haffinger, Pennsylvania Game Commission. Mr. Haffinger was unaware of any sightings of the Indiana bat in the Western Pennsylvania counties of Mercer, Lawrence, Beaver, or Washington within the past ten years. He suggested contacting Pennsylvania Natural Diversity Inventory (PNDI) for a review of historical sightings.

- Contact: Kathy McCenna, PNDI. Ms. McCenna reviewed the Natural Heritage database and distribution maps and found no historical sightings of the Indiana bat in Mercer, Lawrence, Beaver, and Washington counties.

Finally, the "Recovery Plan for the Indiana Bat" (U.S. Fish and Wildlife Service, 1983) does not identify any "critical habitats" for the Indiana bat in Ohio. Although the Recovery

Plan map of "Known and Suspected Range of Indiana Bat" shades the entire state of Ohio, the available published studies (e.g., Hall 1962) identify only areas in southern and central Ohio where these Bats have been sighted historically. The outer boundary of the range appears, therefore, to be drawn somewhat arbitrarily and should not be used to establish the presence or use by the Indiana bat in non-critical areas.

In conclusion, based on the available information, although there is potentially suitable foraging and nesting habitat in the MFLBC study area, the available information indicates that the Indiana bat ~~does not~~ inhabits this part of Ohio.

it is possible, but not probable

4.0 ECOLOGICAL HABITAT INVENTORY AND STREAM SURVEY

The Ecological Habitat Inventory and Stream Survey was conducted over the period October 15-26, 1993, and comprised a field survey of habitats and biota along the MFLBC from the Nease Site to the confluence of the West Fork of Little Beaver Creek with the MFLBC. The study area was divided into 18 stream stretches based on road crossings. The physical habitat of the stream was described at 92 "stream survey points" and the dominant vegetation was described at 196 "habitat description points" along the MFLBC. Major habitat types and vegetation were noted on study area maps. Wetlands were compared to National Wetland Inventory maps, and the present extent of wetlands were shaded on the study area maps. An accompanying list was compiled for birds, mammals, reptiles, and amphibians that were observed during the survey. The full report of the survey is included as Attachment N2.

There were two primary goals for the survey. The first was to provide a more comprehensive description of the dominant physical and vegetative features of the study area (e.g., location and types of wetlands, dominant vegetation, and depositional areas in the stream). At the request of the Agencies, maps have been subsequently prepared which include both the MFLBC habitats and the chemical monitoring data. Figures 2 through 7 of this report present the approximate extent of wetlands adjacent to the MFLBC, habitat description points and stream survey points, and chemical monitoring data.

The second goal of the survey was to record the presence of animals observed in the study area. The list of observed species could then be compared to the lists of species potentially inhabiting the study area based on published literature.

Attachment N2 includes tables of observed species which identify several wildlife species that were observed during the survey but were not anticipated from the published

literature, including the great egret, the common pintail, the white-throated sparrow, the yellow-rumped warbler, and the river otter. These species were, however, represented by other receptor species in the 1993 EA. Therefore, the survey results indicate that appropriate indicator species were selected in the 1993 EA for consideration of the potential dietary exposures and for completion of an analysis of potential risks from Mirex and Photomirex. The 1993 EA receptor species included the heron, kingfisher, sora, rail, robin, harrier, fox, and mink, five of which were observed during the study. All major trophic levels and exposure pathways are addressed using these eight receptor species. No threatened or endangered species were observed during the field survey.

Replace with

In previous draft risk assessment analyses undertaken in 1993, these observed species were represented by receptor species which included the heron, kingfisher, sora, rail, robins, harrier, fox and mink. Five of the receptor species were observed during the field survey, however, no threatened or endangered species were observed.

5.0 CONCLUSIONS

In this Appendix, the results of various studies and sampling programs performed along the MFLBC are summarized. Taking into account all of the available data collected upstream from Lisbon Dam (124 samples), Mirex concentrations in floodplain soils range from non-detect to 6650 µg/kg, with a mean of 317 µg/kg. Mirex concentrations in sediment (70 samples) range from non-detect to an estimated value of 2,820 µg/kg, with a mean of 198 µg/kg. The highest Mirex concentrations in each area occur in floodplain soils as opposed to stream sediments.

Based on Mirex results from the five locations in Area 2 where samples were recovered from different depth intervals during the Area 2 and Phase II sampling programs, Mirex concentrations were found to be highest in surface soils. Overall, Mirex concentrations in floodplain soil and sediment samples collected along the MFLBC are highest in the reach of MFLBC between RI Stations 09 and 14.

Photomirex, a degradation product of Mirex, was detected in 66 of 116 soil samples analyzed and 9 of 56 sediment samples analyzed. In all cases, Photomirex was detected at much lower levels than Mirex in the corresponding samples; in almost all cases, Photomirex levels were an order of magnitude lower than the corresponding Mirex levels. Kepone was detected in 13 of 105 soil samples at concentrations ranging up to 193 µg/kg.

During Phase III, eleven sediment samples were collected for metals analyses. Maximum concentrations for twenty of the twenty-three metals analyzed were detected in sediment samples at locations upstream from the Site. The maximum concentrations of the remaining three metals, iron, silver, and sodium, were detected in samples collected downstream from the Site, but at concentrations within or below background concentrations.

Analysis of VOCs in soils indicated the presence of only one compound that may be Site-related, 1,1,2,2-Tetrachloroethane, reported once at an estimated concentration of 7 µg/kg. Analyses of VOCs in sediments indicated the presence of only three compounds that may be Site-related. 1,2-Dichloroethane was detected once at an estimated concentration of 2 µg/kg. 1,2-Dichloropropane was detected once at a concentration of 18 µg/kg, and 2-Butanone was detected once at an estimated concentration of 10 µg/kg.

Analyses of SVOCs in soils indicated the presence of six compounds that may be Site-related: Phenol, Dibenzofuran, Diethylphthalate, Carbazole, Di-n-octylphthalate, and Butylbenzylpththalate. Phenol was reported at concentrations ranging from not detected to an estimated maximum concentration of 80 µg/kg. Dibenzofuran was reported at concentrations ranging from not detected to an estimated maximum concentration of 240 µg/kg. Diethylphthalate was detected once at an estimated concentration of 83 µg/kg. Carbazole was reported at concentrations ranging from not detected to an estimated maximum concentration of 660 µg/kg. Di-n-octylphthalate was detected once at an estimated concentration of 66 µg/kg, and Butylbenzylphthalate was detected once at an estimated concentration of 77 µg/kg.

Analyses of SVOCs in sediments indicated the presence of only three compounds that may be Site-related: Benzoic acid, Di-n-butylphthalate, and Diphenyl sulfone. Concentrations of Benzoic acid ranged from not detected to an estimated concentration of 430 µg/kg. Reported concentrations of Di-n-butylphthalate ranged from not detected to 74 µg/kg, and reported concentrations of Diphenyl sulfone ranged from not detected to 170 µg/kg.

Analyses of pesticides in soils indicated the presence of eleven compounds. All of the eleven compounds are considered to be from sources other than the Site. Pesticides were not detected in sediments.

The Indiana Bat Habitat Survey determined that although no available data exists to explicitly confirm the use of the MFLBC by the Indiana bat, potentially suitable habitat exists in the area. Further research on sighting information indicated that the Indiana bat has not been sighted in the area and published studies examined do not identify the MFLBC as being part of the Indiana Bat's habitat range. Based on the available information, although there is potentially suitable foraging and nesting habitat in the MFLBC area, the Indiana bat should not be considered as a receptor species.

The Habitat Inventory and Stream Survey performed in 1993 indicated that appropriate receptor species were selected in the 1993 EA for consideration of potential dietary exposures and for completion of an analysis of potential risks from Mirex and Photomirex.

REFERENCES

Cox, C.A. and Colvin G.H., 1995. Investigation of Background Metal Concentrations in Ohio Soils. Cox-Colvin Associates, Hillard, Ohio, (Draft Report, March 1995)

Gilbert, R.O., 1987, Statistical Methods for Environmental Pollution Monitoring, Van Nostrand-Reinhold, New York.

Eastern States Environmental Associates Inc., November 17, 1993, Ecological Habitat Inventory and Stream Survey Report, Prepared for ENVIRON Corporation for Nease Site, Salem, Ohio, Volume I and II.

ERM - Midwest, 1994, MFLBC Statistical Analysis Report, submitted to Ruetgers-Nease Corporation.

ENVIRON Corporation, 1994a, Indiana Bat Habitat Survey: Middle Fork Little Beaver Creek, Salem, Ohio, submitted to USEPA and Ohio EPA (for Ruetgers-Nease Corporation) on February 1, 1994.

ENVIRON Corporation, 1994b, Supplemental Wetland Soil/Sediment Sampling of Egypt Swamp at the Nease Chemical Superfund Site, Salem, Ohio, submitted to USEPA and Ohio EPA (for Ruetgers-Nease Corporation) on March 17, 1994.

Environmental Standards, Inc., 1989, Quality Assurance Review, Ruetgers-Nease Chemical Company, submitted to Ruetgers-Nease Corporation, January 27, 1989.

Hall, J.S., 1962, Life History and Taxonomic Study of the Indiana Bat, *Myotis sidalis.* Scientific Publication #12, Reading Public Museum and Art Gallery, Reading, Pennsylvania.

Ruetgers-Nease Corporation, 1993, Revised RI, submitted to Agencies July 6, 1993.

Ruetgers-Nease Corporation, 1996, Final RI, submitted to Agencies January 31, 1996.

Shacklette, H.T. and Boerngen, J.G. 1984. *Element Concentrations in Soils and Other Surficial Materials of the Conterminous United States.* U.S. Geological Survey Professional Paper 1270, Washington.

U.S. Fish and Wildlife Service, 1983, Recovery Plan for the Indiana Bat, Rockville, Maryland.

LIST OF ABBREVIATIONS

AOC	Administrative Order of Consent
CAL	Centre Analytical Laboratories, Inc.
CRDL	Contract Required Detection Limit
EA	Endangerment Assessment
ERM	Environmental Resource Management Inc.
GS	Grain Size
MFLBC	Middle Fork of Little Beaver Creek
MPK	Mirex, Photomirex, and Kepone
OEPA	Ohio Environmental Protection Agency
PAH	Polynuclear Aromatic Hydrocarbons
PCB	Polychlorinated Biphenyl
QA/QC	Quality Assurance/Quality Control
RI	Remedial Investigation
RNC	Ruetgers-Nease Corporation
SVOC	Semi-Volatile Organic Compound
TAL	Target Analyte List
TCL	Target Compound List
TOC	Total Organic Carbon Content
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Compound
µg/kg	Micrograms per kilogram
mg-C/kg	Milligrams carbon per kilogram

TABLE 1
RANGES OF DISCRETE SAMPLE PARAMETERS UPSTREAM FROM LISBON DAM
MFLBC
Nease Site, Salem, Ohio

PARAMETER SAMPLING EVENT	SAMPLE SIZE	MINIMUM	MAXIMUM	MEAN
Floodplain Soil Mirex (ug/kg)				
1991 RI	24	ND (6)	4,540	654
1993 Phase II (including Area 2)	60	ND (4)	6,650	432
1993 Egypt Swamp	17	2.9	4080	357
1995 Phase III	32	ND (9)	350	106
Combined Results	133	ND (19)	6,650	387
Stream Sediment Mirex (ug/kg)				
1987 USEPA/OEPA	14	ND (7)	1,500	205
1991 RI	41	ND (5)	2,820	239
1993 Phase II	11	11.9	1,190	189
1995 Phase III	4	ND (2)	344	155
Combined Results	70	ND (14)	2,820	197
Floodplain Soil TOC (mg-C/kg-Soil)				
1993 Phase II (including Area 2)	60	9,200	110,000	29,337
1993 Egypt Swamp	17	36,000	492,000	110,765
1995 Phase III	32	600	14,600	4,638
Combined Results	109	600	492,000	48,246
Stream Sediment TOC (mg-C/kg-Sediment)				
1993 Phase II	11	1,000	40,000	8,554
1995 Phase III	4	600	2,000	1,050
Combined Results	15	600	40,000	4,802
Floodplain Soil Fines (%<63 um)				
1993 Phase II (including Area 2)	60	13	94	69
1993 Egypt Swamp	17	59	88	71
1995 Phase III	32	12	94	70
Combined Results	109	12	94	70
Stream Sediment Fines (%<63 um)				
1993 Phase II	11	2	40	16
1995 Phase III	4	6	11	8
Combined Results	15	2	40	12

NOTES:

1. All samples collected upstream from Lisbon Dam. Mirex was detected in one of four overbank deposit soil samples collected downstream from Lisbon Dam at an estimated maximum concentration of 10.1 µg/kg. Mirex was detected in three of thirteen sediment samples collected downstream from Lisbon Dam at an estimated maximum concentration of 10.9 µg/kg.
2. The column heading Sample Size indicates the number of samples collected upstream from Lisbon Dam during the indicated sampling event.
3. If a field duplicate sample was collected at a given location, the primary result and the field duplicate result were compared and the higher of the two results was used to represent the given sample point in summarizing the data.
4. ND(6): not detected, with number of no-detects in sample base in parentheses.
5. TOC: Total Organic Carbon. TOC and Grain Size Distribution (from which "Fines" are determined) have been analyzed only during events occurring since 1991.
6. 1987 analyses by Full Scan GC/MS, all subsequent analyses by PPNCI, Version 4.1.

REFERENCES:

1987 USEPA/OEPA: Quality Assurance Review, Ruetgers-Nease Chemical Company, Environmental Standards, Inc., January 1989.

1991 RI: Remedial Investigaton Report, July 1993, Ruetgers-Nease Corporation.

1993 Phase II: MFLBC Statistical Analysis Report, March 1994, ERM-Midwest, Inc.
Area 2 - OEPA soil sampling at Colonial Villa in August 1991.

1993 Egypt Swamp: Supplemental Wetland Soil/Sediment Sampling of Egypt Swamp at the Nease Chemical Superfund Site, Salem, Ohio, ENVIRON Corp., March 1994.

1995 Phase III: Remedial Investigation, Appendix N, Golder Associates Inc., May 1996.

TABLE 2
Summary of Constituents
Detected in Overbank Deposit Soil Samples
MFLBC Phase I

(All concentrations are in µg/kg)

Sample ID	10-01	10-02	10-03	10-04	12-01	12-02	12-03	12-04	17-01	17-02
Compounds										
Photomirex	29.8 J	4 J	5.2 J	13.3 J	132 J	3.99 J	20.6 J	33.9 J	-	-
Mirex	3040	656	321 J	896	4540	153	1590	1370 J	16.4 J	62.3

Sample ID	17-03	17-04	19A-04	19B-01	19B-02	27-01	27-02	27-03	43-03	SS-71
Compounds										
Photomirex	22.3 J	-	-	-	-	2.5 J	-	20.8 J	-	-
Mirex	1570	24	25.4 J	52	23.9	32.6	609	715	10.1 J	1380 J

J: Quantitation is approximate due to limitations identified during the quality control review.
- Not Detected

For detailed chemistry results, refer to Appendix K.

Sample Identification Number indicates the surface soil (SS) station by number, followed by the sample number.

TABLE 3
Summary of Volatile Organic Compounds Detected in Sediment Samples
MFLBC Phase I
Nease Site, Salem, Ohio
(All concentrations are in µg/kg)

Sample ID	SD-01	SD-65 Dup. of SD-01	SD-02	SD-04	SD-05	SD-6C
Volatiles						
Acetone	69 J	49	54 J	27 J	80 J	57
1,2 Dichloroethane	-	-	-	-	2J	-
2-Butanone	-	-	-	-	-	10 J
1,2 Dichloropropane	-	-	-	-	18	-
Toluene	29 J	6 J	-	-	-	-

Qualifier Codes:
J: Quantitation is approximate due to limitations identified during the quality control review (data validation).
- Not detected

For detailed chemistry results, refer to Appendix K.

TABLE 4
Maximum and Minimum Concentrations of Semivolatile Organics Detected in Sediment Samples
MFLBC Phase I
Nease Site, Salem, Ohio
(All concentrations are in µg/kg)

Semivolatiles	DETECTION FREQUENCY		CONCENTRATION RANGE	
	# Detections	Total # Samples	Minimum	Maximum
4-Methylphenol	9	32	-	2800
Benzoic Acid	2	32	-	430 J
Naphthalene	5	32	-	140 J
2-Methylnaphthalene	7	32	-	100 J
Phenanthrene	24	32	-	1800
Anthracene	3	32	-	340 J
Di-n-Butylphthalate	3	32	-	74 J
Fluoranthene	24	32	-	1100
Pyrene	21	32	-	790
Butylbenzylphthalate	2	32	-	170 J
Benzo(a)Anthracene	15	32	-	480
Chrysene	20	32	-	530
Phenol	2	32	-	160 J
bis(2-Ethylhexyl)Phthalate	12	32	-	1800
Benzo(b)Fluoranthene	22	32	-	920 J
Benzo(k)Fluoranthene	22	32	-	920 J
Benzo(a)Pyrene	19	32	-	390 J
Indeno(1,2,3-cd)Pyrene	10	32	-	200 J
Benzo(g,h,i)Perylene	10	32	-	230 J
Diphenyl Sulfone	2	60	-	170 J
Dibenzo(a,h)Anthracene	1	32	-	150 J
Acenaphthalene	1	32	-	100 J
Dibenzofuran	1	32	-	180 J
Fluorene	1	32	-	230 J

Qualifier Codes:

J: Quantitation is approximate due to limitations identified during the quality control review (data validation).

\- Not detected

For detailed chemistry results, refer to Appendix K.

TABLE 5

Mirex and Photomirex Analytical Results For Sediment Samples

MFLBC Phase I

Nease Site, Salem, Ohio

(All concentrations are in µg/kg)

Sample Concentrations

Upstream Lisbon Dam

Sample #	Mirex	Photomirex
SD-01	-	-
SD-65	7.84 J	-
SD-02	4.26 J	-
SD-03	-	-
SD-04	-	-
SD-05	150	5.75 J
SD-6A	71.5	-
SD-6B	21.5	-
SD-6C	87.8	-
SD-6D	124	-
SD-07	251	-
SD-10	1680	7.38 J
SD-11	527	-
SD-12	423 J	-
SD-70	2820 J	-
SD-13	555	3.09 J
SD-14	1200 J	2.34 J
SD-15	150 J	2.58 J
SD-16	34.6	-
SD-17	42.1 J	-
SD-69	76.7 J	-
SD-17-02	62.3	-
SD-18	57.5	-
SD-19	125	-
SD-19A	-	-
SD-19B	93.7 J	-
SD-20	403 J	-
SD-21	45.5	0.479 J
SD-22	175 J	-
SD-23	107	2.96 J
SD-24	127	-
SD-25	75.3	-
SD-26	181	-
SD-27	158	-
SD-28	100 J	-
SD-29	-	-
SD-30	102 J	-
SD-31	41.5	-
SD-32	33.7	-
SD-33	78.5	-
SD-34	18.5 J	-
SD-35	-	-
SD-37	24.1 J	-
SD-38	58.8.	-
SD-39	-	-
SD-64	21.8 J	-
Downstream Lisbon Dam		
SD-40	-	-
SD-41	-	-
SD-42	10.5 J	-
SD-43	-	-
SD-66	R	R
SD-44	6.30 J	-
SD-45	10.9 J	-
SD-46	-	-
SD-47	-	-
SD-48	-	-
SD-49	-	-
SD-63	-	-
SD-50	-	-
SD-51	-	-
SD-52	-	-

Maximum and Minimum Concentrations

	Upstream Lisbon Dam	
	Mirex	Photomirex
# Detections	39	7
Total # Samples	46	46
Max. Concentration	2820 J	7.38 J
Min. Concentration	-	-

	Downstream Lisbon Dam	
	Mirex	Photomirex
# Detections	3	-
Total # Samples	15	15
Max. Concentration	10.9 J	-
Min. Concentration	-	-

Qualifier Codes:

J: Quantitation is approximate due to limitations identified during the quality control review (data validation).

\- Not detected

R Unreliable result–analyte may or may not be present in this sample.

Duplicate Samples: SD-65 = SD-01
SD-70 = SD-12
SD-69 = SD-17
SD-64 = SD-39
SD-66 = SD-43
SD-63 = SD-49

Mirex minimum reporting limit: 18.5 ug/kg

Photomirex minimum limit: 20.4 ug/kg

Kepone was not detected in any MFLBC sediment sample.

For detailed chemistry results, refer to Appendix K.

TABLE 6A
Parameter Values - Area 2, Alternate Area 3, and Area 5
MFLBC Phase II Sampling
Nease Site, Salem, Ohio

Area 2			Alternate Area 3			Area 5		
Sample Point	Percent Fine Fraction	TOC [mg-C/Kg-BulkSoil]	Sample Point	Percent Fine Fraction	TOC [mg-C/Kg-BulkSoil]	Sample Point	Percent Fine Fraction	TOC [mg-C/Kg-BulkSoil]
SS-09-01	58.7%	24,000	SS-15-01	87.7%	36,000	SS-28-01	13.1%	9,200
SS-09-31(dup of 01)	NA	32,000	SS-15-02	88.0%	41,000	SS-28-02	89.5%	42,000
SS-09-02	77.6%	26,000	SS-15-16 (dup of 02)	NA	32,000	SS-28-03	45.1%	18,000
SS-09-03	67.8%	13,000	SS-15-03	76.1%	30,000	SS-28-04	45.0%	49,000
SS-09-04	48.3%	14,000	SS-15-04	71.3%	14,000	SS-28-05	82.8%	48,000
SS-09-05	77.5%	20,000	SS-15-05	84.4%	33,000	SS-28-21 (dup of 05)	NA	66,000
SS-09-06	42.8%	17,000	SS-15-06	81.9%	23,000	SS-28-06	90.3%	37,000
SS-09-07	48.2%	25,000	SS-15-07	70.1%	18,000	SS-28-07	40.7%	33,000
SS-09-08	43.2%	13,000	SS-15-08	77.7%	18,000	SS-28-08	76.9%	22,000
SS-09-09	57.2%	21,000	SS-15-09	75.1%	10,000	SS-28-09	48.0%	19,000
SS-09-10	59.4%	17,000	SS-15-10	75.8%	24,000	SS-28-10	91.6%	40,000
SS-09-11	42.1%	27,000	SS-15-11	88.0%	18,000	SS-28-11	84.8%	32,000
SS-09-12	72.3%	24,000	SS-15-12	83.8%	18,000	SS-28-12	91.5%	76,000
SS-09-13	73.0%	26,000	SS-15-17 (dup of 12)	NA	20,000	SS-28-13	88.2%	29,000
SS-09-14	61.6%	18,000	SS-15-13	85.8%	53,000	SS-28-14	70.9%	77,000
SS-09-15	62.1%	18,000	SS-15-14	85.5%	22,000	SS-28-22 (dup of 14)	NA	110,000
SS-09-21	51.8%	32,000	SS-15-15	74.2%	16,000	SS-28-15	37.6%	46,000
SS-09-22	41.5%	30,000	Averages	69.9%	24,375	SS-28-16	68.3%	31,000
SS-09-23	76.9%	51,000				SS-28-17	70.3%	50,000
SS-09-24	82.4%	30,000				SS-28-18	92.0%	25,000
SS-09-25	73.1%	28,000				SS-28-19	93.9%	25,000
SS-09-26	58.1%	20,000				SS-28-20	82.6%	29,000
SS-09-27	54.4%	20,000				Averages	63.8%	41,509
SS-09-28	55.0%	24,000						
SS-09-29	63.9%	26,000						
SS-09-30	58.1%	24,000						
Averages	58.0%	23,846						

Note:
Fine Fraction = Weight Fraction of bulk-soil passing 63um seive.
TOC = Total Organic Carbon content
For TOC, if primary and field duplicate sample were collected at given location, higher of two results was selected to represent location. Fine Fractions for duplicates were unavailable for comparison.
NA-Not Available

TABLE 6

Ruetgers-Nease Corporation

MFLBC Overbank Deposit and Sediment Sampling, Phase II

Sampling Dates: May 10 thru May 15, 1993

Mirex\Photomirex\Kepone, Total Organic Carbon, & Grainsize Samples (1)

Northing	Easting	Elevation	Area	Sample Number	Bur. Num	Other Desig	Mirex ug/kg	Photo M ug/kg	Kepone ug/kg	TOC mg/kg	D10 um	D30 um	D60 um	Sample Depth	QA/QC Sample
468879.440	2446636.259	1103.11	2	RNS-SS-09-01	SL-1		54.2			24000	0.61	9.0	70	(0-6")	
468976.563	2447090.267	1102.79	2	RNS-SS-09-02	SL-5		17.3			26000	0.68	8.8	36	(0-6")	
469125.436	2446642.301	1101.80	2	RNS-SS-09-03	SL-7		10.2			13000	0.18	10.0	51	(0-6")	
469228.998	2446985.305	1101.26	2	RNS-SS-09-04	SL-8		48.7	4.64		14000	0.75	23.0	128	(0-6")	
469335.432	2446662.343	1101.87	2	RNS-SS-09-05	SL-17					20000	0.10	4.8	30	(0-6")	
469336.993	2446986.346	1101.35	2	RNS-SS-09-06	SL-18		29.2			17000	2.00	41.0	150	(0-6")	
469377.555	2447194.350	1100.66	2	RNS-SS-09-07	SL-19		18.5			25000	2.00	30.0	110	(0-6")	
469398.677	2447580.357	1099.44	2	RNS-SS-09-08	SL-24		2870			13000	1.50	35.0	120	(0-6")	
469685.112	2447316.395	1111.65	2	RNS-SS-09-09	SL-26		28.9			21000	0.73	17.5	75	(0-6")	
469544.673	2447601.399	1099.76	2	RNS-SS-09-10	SL-25		74	3.29		17000	2.30	21.0	63	(0-6")	
469024.217	2446874.804	1101.70	2	RNS-SS-09-11	SL-6	CV-1	958*	58*	*	27000	3.00	36.0	175	(0-6")	
469236.322	2447398.319	1099.16	2	RNS-SS-09-12	SL-15	CV-11	655*	94*	*	24000	1.50	9.3	32	(0-6")	
469241.107	2447470.445	1100.05	2	RNS-SS-09-13	SL-16	CV-13	42.1*	4*	*	26000	1.90	11.0	43	(0-6")	
469264.572	2447386.316	1098.90	2	RNS-SS-09-14	SL-20	CV-10	6850*	104*	*	18000	2.50	16.8	57	(0-6")	
469280.009	2447449.070	1099.59	2	RNS-SS-09-15	SL-21	CV-12	301*	46*	*	18000	1.40	14.0	57	(0-6")	
469024.217	2446874.804	1101.70	2	RNS-SS-09-16	SL-6	CV-1	41.3	2.41		15000	3.60	73.0	305	(6-12")	
469236.322	2447398.319	1099.16	2	RNS-SS-09-17	SL-15	CV-11	342	21.2		15000	0.17	7.1	45	(6-12")	
469241.107	2447470.445	1100.05	2	RNS-SS-09-18	SL-16	CV-13	24.1	2.33		26000	0.61	9.8	44	(6-12")	

Notes:

(1) Table provided by MFLBC Statistical Analysis Report, ERM-Midwest, March 1994.

(2) "*" Result of sample collected at Colonial Villa by OEPA in August 1991. If no value accompanies asterisk, result was considered either not detected or unusable.

(3) Columns bearing headings D10, D30, and D60 um indicate particle sizes below which 10%, 30%, and 60% of soil by weight is composed, respectively.

(4) Validation qualifiers are not shown. See Figures 2,3, and 5 of Appendix N.

TABLE 6

Ruetgers-Nease Corporation

MFLBC Overbank Deposit and Sediment Sampling, Phase II

Sampling Dates: May 10 thru May 15, 1993

Mirex\Photomirex\Kepone, Total Organic Carbon, & Grainsize Samples (1)

Northing	Easting	Elevation	Area	Sample Number	Sur. Num	Other Desig.	Mirex ug/kg	Photo M ug/kg	Kepone ug/kg	TOC mg/kg	D10 um	D30 um	D60 um	Sample Depth	QA/QC Sample
469264.572	2447386.316	1098.90	2	RNS-SS-09-19	SL-20	CV-10	3740	129	30.7	17000	0.14	11.0	55	(6-12")	
469280.009	2447449.070	1099.59	2	RNS-SS-09-20	SL-21	CV-12	223			15000	0.41	8.2	40	(6-12")	
468846.691	2446918.817	1104.89	2	RNS-SS-09-21	SL-2	CV-3	1.74*	•	•	32000	1.60	25.0	70	(0-6")	
468981.996	2446885.018	1102.43	2	RNS-SS-09-22	SL-4	CV-2	17.7*	2*	•	30000	4.80	38.0	165	(0-6")	
468897.401	2447182.891	1102.37	2	RNS-SS-09-23	SL-3	CV-6	10.8*	1*	•	51000	0.50	7.4	37	(0-6")	
469044.439	2447122.031	1101.67	2	RNS-SS-09-24	SL-11	CV-5	13.3*	1*	•	30000	1.00	8.0	26	(0-6")	
469106.496	2447098.025	1100.50	2	RNS-SS-09-25	SL-10	CV-4	29.4*	1*	•	28000	1.50	11.0	50	(0-6")	
469148.022	2447250.173	1101.52	2	RNS-SS-09-26	SL-13	CV-8	15.2*	1*	•	20000	3.60	19.8	66	(0-6")	
469198.270	2447230.483	1101.15	2	RNS-SS-09-27	SL-12	CV-7	19*	2*	•	20000	3.40	26.0	74	(0-6")	
469041.815	2447294.290	1106.06	2	RNS-SS-09-28	SL-14	CV-9	0.719*	•	•	24000	4.00	19.5	69	(0-6")	
469264.572	2447592.584	1102.50	2	RNS-SS-09-29	SL-22	CV-15	1.99*	•	•	26000	0.40	9.0	59	(0-6")	
469331.569	2447555.626	1100.70	2	RNS-SS-09-30	SL-23	CV-14	4.42*	1*	•	24000	1.00	13.0	69	(0-6")	
468879.440	2446636.259	1103.11	2	RNS-SS-09-31	SL-1		76			32000	1.00	20.0	70	(0-6")	DUP SS-09-01
475433.616	2459610.772	1042.48	Alt.3	RNS-SS-15-01	SL-3		24.2	1.46		36000	0.10	4.0	19	(0-6")	SS-15-01-113 FB
475180.616	2460002.772	1042.49	Alt.3	RNS-SS-15-02	SL-2		27.6	3.16		41000	0.66	7.0	25	(0-6")	
475144.616	2460382.722	1038.17	Alt.3	RNS-SS-15-03	SL-1		57.2			30000	0.10	5.0	39	(0-6")	MS/MSD
475744.616	2459486.772	1044.24	Alt.3	RNS-SS-15-04	SL-6		4.19			14000	0.51	8.9	33	(0-6")	
475450.616	2459583.772	1042.70	Alt.3	RNS-SS-15-05	SL-4		8.9	1.1		33000	0.10	2.9	19	(0-6")	

Notes:

(1) Table provided by MFLBC Statistical Analysis Report, ERM-Midwest, March 1994.

(2) "*" Result of sample collected at Colonial Villa by OEPA in August 1991. If no value accompanies asterisk, result was considered either not detected or unusable.

(3) Columns bearing headings **D10, D30, and D60 um** indicate particle sizes below which 10%, 30%, and 60% of soil by weight is composed, respectively.

(4) *Validation qualifiers are not shown. See Figures 2,3, and 5 of Appendix N.*

TABLE 6

Ruetgers-Nease Corporation

MFLBC Overbank Deposit and Sediment Sampling, Phase II

Sampling Dates: May 10 thru May 15, 1993

Mirex\Photomirex\Kepone, Total Organic Carbon, & Grainsize Samples (1)

Northing	Easting	Elevation	Area	Sample Number	Sur. Num	Other Desig	Mirex ug/kg	Photo M ug/kg	Kepone ug/kg	TOC mg/kg	D10 um	D30 um	D60 um	Sample Depth	QA/QC Sample
475694.616	2460252.772	1043.57	Alt.3	RNS-SS-15-06	SL-5		23.2			23000	0.01	6.8	30	(0-6")	
476205.616	2459338.772	1044.21	Alt.3	RNS-SS-15-07	SL-9		320	6.1		18000	0.25	13.1	50	(0-6")	
476124.616	2459597.772	1043.61	Alt.3	RNS-SS-15-08	SL-8		23.3			18000	0.45	9.5	40	(0-6")	
476060.616	2459952.772	1042.73	Alt.3	RNS-SS-15-09	SL-7		25.8			10000	0.35	10.5	44	(0-6")	
476629.616	2459346.772	1043.93	Alt.3	RNS-SS-15-10	SL-15		407	11.7		24000	0.72	6.3	45	(0-6")	
476451.616	2459940.772	1043.72	Alt.3	RNS-SS-15-11	SL-11		26.7			18000	0.12	4.0	17	(0-6")	
476346.616	2459965.772	1043.15	Alt.3	RNS-SS-15-12	SL-10		41.1			18000	0.55	5.2	21	(0-6")	
476783.616	2459349.772	1045.72	Alt.3	RNS-SS-15-13	SL-14		15.9			53000	0.52	7.0	27	(0-6")	
476738.616	2459944.772	1043.26	Alt.3	RNS-SS-15-14	SL-13		11.6			22000	0.38	3.7	17	(0-6")	
476921.616	2460035.772	1046.14	Alt.3	RNS-SS-15-15	SL-12					16000	0.68	5.8	27	(0-6")	
475180.616	2460002.772	1042.49	Alt.3	RNS-SS-15-16	SL-2		33.2			32000	0.40	7.0	21	(0-6")	DUP SS-15-02
476346.616	2459965.772	1043.15	Alt.3	RNS-SS-15-17	SL-10		37.9			20000	0.60	5.5	20	(0-6")	DUP SS-15-12
440783.173	2472722.075	1007.23	5	RNS-SS-28-01	SL-1		105			9200	50.00	150.0	250	(0-6")	SS-28-01-114 FB
441013.873	2472679.075	999.49	5	RNS-SS-28-02	SL-2		2600	13.5		42000	0.05	2.1	15	(0-6")	
441044.873	2472864.775	999.42	5	RNS-SS-28-03	SL-3		270			18000	2.00	32.0	165	(0-6")	
441480.273	2472583.375	1010.44	5	RNS-SS-28-04	SL-4					49000	5.50	30.0	250	(0-6")	
441393.273	2472839.075	1000.92	5	RNS-SS-28-05	SL-5		336	24.9		48000	0.32	4.1	21	(0-6")	
441424.273	2472925.775	1000.30	5	RNS-SS-28-06	SL-6		1360	2.48		37000	0.40	1.9	11	(0-6")	MS/MSD

Notes:

(1) *Table provided by MFLBC Statistical Analysis Report*, ERM-Midwest, March 1994.

(2) "" Result of sample collected at Colonial Villa by OEPA in August 1991. If no value accompanies asterisk, result was considered either not detected or unusable.

(3) Columns bearing headings **D10, D30, and D60 um** indicate particle sizes below which 10%, 30%, and 60% of soil by weight is composed, respectively.

(4) Validation qualifiers are not shown. See Figures 2,3, and 5 of Appendix N.

TABLE 6.

Ruetgers-Nease Corporation

MFLBC Overbank Deposit and Sediment Sampling, Phase II

Sampling Dates: May 10 thru May 15, 1993

Mirex\Photomirex\Kepone, Total Organic Carbon, & Grainsize Samples (1)

Northing	Easting	Elevation	Area	Sample Number	Sur. Num	Other Desig.	Mirex ug/kg	Photo M ug/kg	Kepone ug/kg	TOC mg/kg	D10 um	D30 um	D60 um	Sample Depth	QA/QC Sample
441678.973	2472682.075	1007.37	5	RNS-SS-28-07	SL-7		6.5			33000	2.60	36.0	242	(0-6")	
441575.973	2472925.775	1001.19	5	RNS-SS-28-08	SL-8		717	81.1		22000	0.59	7.1	33	(0-6")	
441858.673	2472763.075	1000.64	5	RNS-SS-28-09	SL-9		283	7.6		19000	1.00	23.0	120	(0-6")	
442039.373	2472781.075	1001.05	5	RNS-SS-28-10	SL-10		1220	34.7		40000	0.57	2.5	9	(0-6")	
441941.373	2472911.775	1001.92	5	RNS-SS-28-11	SL-11		758	115		32000	0.50	6.9	28	(0-6")	
442170.073	2472754.075	999.59	5	RNS-SS-28-12	SL-12		206			76000	1.30	4.0	9	(0-6")	
442308.073	2473036.775	1001.09	5	RNS-SS-28-13	SL-13		1240	73		29000	0.09	4.9	19	(0-6")	
442374.773	2472756.075	1001.31	5	RNS-SS-28-14	SL-14		259			77000	2.30	7.5	45	(0-6")	
442492.773	2473005.775	1003.69	5	RNS-SS-28-15	SL-15		18.6			46000	2.90	35.0	155	(0-6")	
442350.773	2473170.475	999.69	5	RNS-SS-28-16	SL-16		381	9.9		31000	0.40	7.0	40	(0-6")	SS-28-16-115 FB
442582.473	2472643.375	1013.34	5	RNS-SS-28-17	SL-17					50000	0.09	1.9	28	(0-6")	
442625.473	2472789.075	1002.56	5	RNS-SS-28-18	SL-18		803	34.2		25000	0.05	1.7	16	(0-6")	
442533.473	2473180.475	1000.70	5	RNS-SS-28-19	SL-19		1290	44.9		25000	0.60	3.0	15	(0-6")	
442724.173	2473106.475	1001.15	5	RNS-SS-28-20	SL-20		1120	46.6		29000	0.20	3.0	30	(0-6")	
441393.273	2472839.075	1000.92	5	RNS-SS-28-21	SL-5		271	23.1		66000	0.50	4.5	30	(0-6")	DUP SS-28-05
442374.773	2472756.075	1001.31	5	RNS-SS-28-22	SL-14		261	5.9		110000	1.50	5.5	20	(0-6")	DUP SS-28-14
469116.394	2446879.759	1196.90	2	RNS-SD-09-02		S-169	191			1400	115.00	255.0	405	(0-6")	
469268.271	2447274.973	1098.00	2	RNS-SD-09-03		S-171	1190			4500	64.00	218.0	322	(0-6")	

Notes:

(1) Table provided by MFLBC Statistical Analysis Report, ERM-Midwest, March 1994.

(2) "*" Result of sample collected at Colonial Villa by OEPA in August 1991. If no value accompanies asterisk, result was considered either not detected or unusable.

(3) Columns bearing headings **D10, D30, and D60 um** indicate particle sizes below which 10%, 30%, and 60% of soil by weight is composed, respectively.

(4) Validation qualifiers are not shown. See Figures 2,3, and 5 of Appendix N.

TABLE 6

Ruetgers-Nease Corporation

MFLBC Overbank Deposit and Sediment Sampling, Phase II

Sampling Dates: May 10 thru May 15, 1993

Mirex\Photomirex\Kepone, Total Organic Carbon, & Grainsize Samples (1)

Northing	Easting	Elevation	Area	Sample Number	Sur. Num	Other Desig.	Mirex ug/kg	Photo M ug/kg	Kepone ug/kg	TOC mg/kg	D10 um	D30 um	D60 um	Sample Depth	QA/QC Samples
469457.853	2447800.432	1195.70	2	RNS-SD-09-04		S-179	179			1600	270.00	550.0	2950	(0-6")	
469457.853	2447800.432	1195.70	2	RNS-SD-09-05		S-179	71.3			1300	300.00	750.0	5000	(0-6")	DUP SD-09-04
476711.410	2458969.415	1042.40	Alt. 3	RNS-SD-15-02		S-438	11.9			1000	170.00	220.0	400	(0-6")	MS/MSD
476158.371	2459350.339	1038.20	Alt. 3	RNS-SD-15-03		S-450	37.9	1		1500	60.00	180.0	280	(0-6")	
475744.813	2460207.155	1036.20	Alt. 3	RNS-SD-15-04		S-471	20.5			1500	68.00	315.0	540	(0-6")	
475372.722	2460406.895	1035.10	Alt. 3	RNS-SD-15-05		S-479	29.2			1600	95.00	270.0	405	(0-6")	
475218.172	2460744.027	1034.50	Alt. 3	RNS-SD-15-06		S-484	24			13000	125.00	220.0	315	(0-6")	
442425.873	2473064.977	996.40	5	RNS-SD-28-02		S-681	138.5	1.6		9000	7.00	67.0	306	(0-6")	SD-28-02-116 FB
441442.150	2473014.512	995.70	5	RNS-SD-28-03		S-688	223			40000	3.00	55.0	251	(0-6")	MS/MSD
441136.622	2472954.543	994.60	5	RNS-SD-28-04		S-689	28.6			19000	0.09	51.0	165	(0-6")	
441136.622	2472954.543	994.60	5	RNS-SD-28-05		S-689	32.2			13000	1.00	51.5	170	(0-6")	DUP SD-28-04

Notes:

(1) Table provided by MFLBC Statistical Analysis Report, ERM-Midwest, March 1994.

(2) "*" Result of sample collected at Colonial Villa by OEPA in August 1991. If no value accompanies asterisk, result was considered either not detected or unusable.

(3) Columns bearing headings D10, D30, and D60 um indicate particle sizes below which 10%, 30%, and 60% of soil by weight is composed, respectively.

(4) Validation qualifiers are not shown. See Figures 2,3, and 5 of Appendix N.

TABLE 7

Ruetgers-Nease Corporation

MFLBC Overbank Deposit and Sediment Sampling, Phase II

Sampling Dates: May 10 thru May 16, 1993

Mirex\Photomirex\Kepone, Total Organic Carbon & Grainsize Samples - Location Descriptions (1)

Northing	Easting	Elevation	Area	Sample Number	Other Desig	Sample Depth	Sampling Location Description
468879.44	2446636.259	1103.11	2	RNS-SS-09-01		(0-6")	Moist, brown silt loam, heavy grass cover
468978.563	2447090.267	1102.79	2	RNS-SS-09-02		(0-6")	Moist, brown silt loam, trace oxidation, mottles - light vegetation
469125.436	2446642.301	1101.8	2	RNS-SS-09-03		(0-6")	Moist, red-brown silt/sand loam, light root zone, grass cover, standing water evidence
469228.998	2446985.305	1101.26	2	RNS-SS-09-04		(0-6")	Same as above - brush and tree saplings nearby
469335.432	2446662.343	1101.87	2	RNS-SS-09-05		(0-6")	Black muck soil and red-brown clay in standing water, cattails
469336.993	2446968.346	1101.35	2	RNS-SS-09-06		(0-6")	Very moist-wet clayey sand, adjacent to standing water, cattails, grasses, abundant trees
469377.555	2447194.35	1100.66	2	RNS-SS-09-07		(0-6")	Very moist red-brown silty, fine sandy clay, heavy grass cover, light root zone, trees
469396.677	2447580.357	1099.44	2	RNS-SS-09-08		(0-6")	Wet brown silty sand with black clay at creek edge (emergent) no vegetation
469685.112	2447316.395	1111.65	2	RNS-SS-09-09		(0-6")	Moist brown silty clay with abundant root hairs in drainage ditch, some gravel, grass vegetation
469544.673	2447601.399	1099.76	2	RNS-SS-09-10		(0-6")	Moist red-brown silt loam, heavy grass cover, heavy root zone, scattered brush
469024.217	2446874.804	1101.7	2	RNS-SS-09-11	CV-1	(0-6")	Moist brown sandy loam with gravel, heavy mowed grass cover
469236.322	2447398.319	1099.16	2	RNS-SS-09-12	CV-11	(0-6")	Moist brown silt clay loam, heavy mowed grass cover
469241.107	2447470.445	1100.05	2	RNS-SS-09-13	CV-13	(0-6")	Moist brown clay loam, heavy mowed grass cover
469264.572	2447386.316	1096.9	2	RNS-SS-09-14	CV-10	(0-6")	Moist brown silt loam, heavy mowed grass cover, located on side of small swale
469280.009	2447449.07	1099.59	2	RNS-SS-09-15	CV-12	(0-6")	Moist brown silt loam, heavy mowed grass cover
469024.217	2446874.804	1101.7	2	RNS-SS-09-16	CV-1	(6-12")	Moist brown sandy loam with gravel, below RNS-SS-09-11
469236.322	2447398.319	1099.16	2	RNS-SS-09-17	CV-11	(6-12")	Moist brown silt loam, below RNS-SS-09-12
469241.107	2447470.445	1100.05	2	RNS-SS-09-18	CV-13	(6-12")	Moist brown clay loam with red mottles, below RNS-SS-09-13
469264.572	2447386.316	1096.9	2	RNS-SS-09-19	CV-10	(6-12")	Moist brown silt loam, below RNS-SS-09-14
469280.009	2447449.07	1099.59	2	RNS-SS-09-20	CV-12	(6-12")	Moist brown silt loam, below RNS-SS-09-15
468846.691	2446918.817	1104.89	2	RNS-SS-09-21	CV-3	(0-6")	Moist dark brown silty sandy clay, trace cobbles, roots, part of mowed area near pool

Notes:

(1) Table provided by MFLBC Statistical Analysis Report, ERM-Midwest, March 1994.

TABLE 7

Ruetgers-Nease Corporation

MFLBC Overbank Deposit and Sediment Sampling, Phase II

Sampling Dates: May 10 thru May 15, 1993

Mirex\Photomirex\Kepone, Total Organic Carbon & Grainsize Samples - Location Descriptions (1)

Northing	Easting	Elevation	Area	Sample Number	Other Desig	Sample Depth	Sampling Location Description
468981.996	2446885.018	1102.43	2	RNS-SS-09-22	CV-2	(0-6")	Moist brown sandy loam, trace gravel, heavy grass in mowed area
468697.401	2447182.891	1102.37	2	RNS-SS-09-23	CV-6	(0-6")	Wet brown clay loam, wet area surrounded by cattails
469044.439	2447122.031	1101.67	2	RNS-SS-09-24	CV-5	(0-6")	Moist red-brown clay loam, heavy mowed grass cover
469106.496	2447088.025	1100.5	2	RNS-SS-09-25	CV-4	(0-6")	Moist brown clay loam, heavy mowed grass cover
469148.022	2447250.173	1101.52	2	RNS-SS-09-26	CV-8	(0-6")	Moist brown silt loam with some gravel, heavy mowed grass cover
469196.27	2447230.483	1101.15	2	RNS-SS-09-27	CV-7	(0-6")	Moist red-brown silt loam with gravel, heavy mowed grass cover
469041.815	2447294.29	1106.06	2	RNS-SS-09-28	CV-9	(0-6")	Moist brown clay loam with abundant root hairs above flat of overbank, heavy mowed grass cover
469264.572	2447592.584	1102.5	2	RNS-SS-09-29	CV-15	(0-6")	Moist sandy loam and gravel in heavy mowed grass cover
469331.569	2447555.626	1100.7	2	RNS-SS-09-30	CV-14	(0-6")	Moist brown sandy clay loam, heavy mowed grass cover
468679.44	2446636.259	1103.11	2	RNS-SS-09-31		(0-6")	Moist, brown silt loam, heavy grass cover
475433.616	2459610.772	1042.48	Alt.3	RNS-SS-15-01		(0-6")	Moist brown silt loam in fallow soybean field with sparse weed growth
475160.616	2460002.772	1042.49	Alt.3	RNS-SS-15-02		(0-6")	Moist brown silt loam in heavily wooded area beneath tree, near very old abandoned channel
475144.616	2460382.722	1038.17	Alt.3	RNS-SS-15-03		(0-6")	Moist brown silt clay loam, located in heavily wooded area adjacent to small feeder creek
475744.616	2459486.772	1044.24	Alt.3	RNS-SS-15-04		(0-6")	Moist brown silt loam in fallow soybean field with sparse weed growth
475450.616	2459583.772	1042.7	Alt.3	RNS-SS-15-05		(0-6")	Moist brown silt loam in fallow soybean field with sparse weed growth
475894.616	2460252.772	1043.57	Alt.3	RNS-SS-15-06		(0-6")	Moist brown silt loam at edge of cut bank approximately 6 feet above creek, heavy trees and brush
476205.616	2459338.772	1044.21	Alt.3	RNS-SS-15-07		(0-6")	Moist red-brown sand loam located near fence row in wooded and brushy area
476124.616	2459597.772	1043.81	Alt.3	RNS-SS-15-08		(0-6")	Moist brown silt loam in plowed corn field
476060.616	2459952.772	1042.73	Alt.3	RNS-SS-15-09		(0-6")	Moist brown clay loam in plowed corn field
476829.616	2459346.772	1043.93	Alt.3	RNS-SS-15-10		(0-6")	Slightly moist red-brown silt loam on fence row within heavily wooded area
476451.616	2459940.772	1043.72	Alt.3	RNS-SS-15-11		(0-6")	Moist brown clay loam in plowed corn field

Notes:

(1) Table provided by MFLBC Statistical Analysis Report, ERM-Midwest, March 1994.

TABLE 7

Ruetgers-Nease Corporation

MFLBC Overbank Deposit and Sediment Sampling, Phase II

Sampling Dates: May 10 thru May 15, 1993

Mirex\Photomirex\Kepone, Total Organic Carbon & Grainsize Samples - Location Descriptions (1)

Northing	Easting	Elevation	Area	Sample Number	Other Desig	Sample Depth	Sampling Location Description
476346.616	2459965.772	1043.15	Alt.3	RNS-SS-15-12		(0-6")	Moist brown clay loam in plowed cornfield
476783.616	2459349.772	1045.72	Alt.3	RNS-SS-15-13		(0-6")	Slightly moist red-brown silt loam on fence row within heavily wooded area
476738.616	2459944.772	1043.26	Alt.3	RNS-SS-15-14		(0-6")	Moist red-brown clay loam in plowed cornfield
476921.616	2460035.772	1046.14	Alt.3	RNS-SS-15-15		(0-6")	Moist red-brown clay loam in plowed cornfield
475180.616	2460002.772	1042.49	Alt.3	RNS-SS-15-16		(0-6")	Moist brown silt loam in heavily wooded area beneath tree, near very old abandoned channel
476346.616	2459965.772	1043.15	Alt.3	RNS-SS-15-17		(0-6")	Moist brown clay loam in plowed cornfield
440783.173	2472722.075	1007.23	5	RNS-SS-28-01		(0-6")	Moist fine sand, trace pebbles, heavy grass and trees, adjacent to high cut bank
441013.673	2472679.075	999.49	5	RNS-SS-28-02		(0-6")	Moist brown silty clay in heavy weeds and brush, adjacent to high cut bank
441044.873	2472864.775	999.42	5	RNS-SS-28-03		(0-6")	Moist brown fine sand and silt adjacent to high cut bank, heavy weeds
441480.273	2472583.375	1010.44	5	RNS-SS-28-04		(0-6")	Moist red-brown sandy loam with pebbles, on edge on old road grade
441393.273	2472839.075	1000.92	5	RNS-SS-28-05		(0-6")	Moist red-brown silty clay loam located in brushy area near very old log jam
441424.273	2472925.775	1000.3	5	RNS-SS-28-06		(0-6")	Moist red-brown silty clay loam, oxidized mottles, heavy grass cover with nearby brush
441678.973	2472682.075	1007.37	5	RNS-SS-28-07		(0-6")	Moist red-brown silt loam with gravel, located above break in flat area
441575.973	2472925.775	1001.19	5	RNS-SS-28-08		(0-6")	Moist red-brown silty clay loam in heavy grass cover
441858.673	2472763.075	1000.64	5	RNS-SS-28-09		(0-6")	Moist fine sand with silt and some clay on side of cut bank approximately 1.5 feet below top
442039.373	2472781.075	1001.05	5	RNS-SS-28-10		(0-6")	Very moist brown silty clay, swampy area nearby, heavy brush
441941.373	2472911.775	1001.92	5	RNS-SS-28-11		(0-6")	Moist brown silt loam, adjacent to tree in wooded area with heavy weeds
442170.073	2472754.075	999.59	5	RNS-SS-28-12		(0-6")	Saturated black muck soil in thick brushy swamp
442308.073	2473036.775	1001.09	5	RNS-SS-28-13		(0-6")	Moist red-brown silty clay loam in heavy grass adjacent to wooded area
442374.773	2472756.075	1001.31	5	RNS-SS-28-14		(0-6")	Wet, brown muck & silty clay, grass covered near swamp
442492.773	2473005.775	1003.69	5	RNS-SS-28-15		(0-6")	Moist red-brown sandy loam adjacent to a suspect levee deposit

Notes:

(1) Table provided by MFLBC Statistical Analysis Report, ERM-Midwest, March 1994.

TABLE 7

Ruetgers-Nease Corporation

MFLBC Overbank Deposit and Sediment Sampling, Phase II

Sampling Dates: May 10 thru May 15, 1993

Mirex\Photomirex\Kepone, Total Organic Carbon & Grainsize Samples - Location Descriptions (1)

Northing	Easting	Elevation	Area	Sample Number	Other Desig	Sample Depth	Sampling Location Description
442350.773	2473170.475	999.69	5	RNS-SS-28-16		(0-6")	Moist red-brown silty clay loam, heavy grass and weeds, adjacent to ox bow
442582.473	2472643.375	1013.34	5	RNS-SS-28-17		(0-6")	Dark gray silty clay on side of coal spoil pile, heavily wooded
442625.473	2472789.075	1002.56	5	RNS-SS-28-18		(0-6")	Moist brown silty clay, bare ground surrounded by heavy brush
442533.473	2473180.475	1000.7	5	RNS-SS-28-19		(0-6")	Red-brown silty clay loam, light grass, wooded, adjacent to oxbow
442724.173	2473106.475	1001.15	5	RNS-SS-28-20		(0-6")	Moist brown, soft, silty clay, in area of dead grass (from previous standing water) and brush
441393.273	2472639.075	1000.92	5	RNS-SS-28-21		(0-6")	Moist red-brown silty clay loam located in brushy area near very old log jam
442374.773	2472756.075	1001.31	5	RNS-SS-28-22		(0-6")	Wet, brown muck & silty clay, grass covered near swamp
469116.3936	2446879.7568	1196.9	2	RNS-SD-09-02	S-169	(0-6")	Submergent in relatively calm straight section
469268.2712	2447274.9732	1098	2	RNS-SD-09-03	S-171	(0-6")	Emergent heavily grassed in calm straight section
469457.8526	2447800.4316	1195.7	2	RNS-SD-09-04	S-179	(0-6")	Submergent in deep pool on calm bend
469457.8526	2447800.4316	1195.7	2	RNS-SD-09-05	S-179	(0-6")	Submergent in deep pool on calm bend
478711.4095	2458969.4148	1042.4	Alt. 3	RNS-SD-15-02	S-436	(0-6")	Submergent in shallow very long straight section
476158.3714	2459350.3392	1038.2	Alt. 3	RNS-SD-15-03	S-450	(0-6")	Submergent in relatively deep pool on bend
476744.8127	2460207.1548	1036.2	Alt. 3	RNS-SD-15-04	S-471	(0-6")	Submergent adjacent to tributary, calm
475372.7219	2460406.8949	1035.1	Alt. 3	RNS-SD-15-05	S-479	(0-6")	Emergent in calm narrow straight section
475218.1724	2460744.0265	1034.5	Alt. 3	RNS-SD-15-06	S-484	(0-6")	Submergent in calm pool under bridge
442425.8731	2473064.9773	996.4	5	RNS-SD-28-02	S-681	(0-6")	Submergent in calm long gentle bend
441442.1495	2473014.5116	995.7	5	RNS-SD-28-03	S-688	(0-6")	Submergent in relatively deep calm pool
441136.6223	2472954.5426	994.6	5	RNS-SD-28-04	S-689	(0-6")	Submergent in relatively deep calm pool
441136.6223	2472954.5426	994.6	5	RNS-SD-28-05	S-689	(0-6")	Submergent in relatively deep calm pool

Notes:

(1) Table provided by MFLBC Statistical Analysis Report, ERM-Midwest, March 1994.

TABLE 8
Preferred Habitats for Indicator Species
Nease Site, Salem, Ohio

Indicator Species	Preferred Habitats	Reference
Great blue heron	Shallow shores of ponds, lakes, streams, and rivers; wooded swamps; freshwater bogs and marshes. Nests in tall trees near water or wetlands. (PFO, PSS, PEM, OW)	Short and Cooper 1985; DeGraaf and Rudis 1987
Belted kingfisher	Pond, lake, river, and stream edges with abundant fish, clear water, and available perch sites. Nests in upland banks near water. (OW)	Prose 1985; DeGraaf and Rudis 1987
Sora	Shallow freshwater marshes with high interspersion of open water and dense emergent vegetation. (PEM, OW)	Melvin and Gibbs 1994; DeGraaf and Rudis 1987
Virginia rail	Shallow freshwater marshes with dense emergent vegetation interspersed with open water or mud flats. (PEM, OW)	Conway and Eddleman 1994; DeGraaf and Rudis 1987
Northern harrier	Open country (fields or agricultural areas); freshwater marshes; wet meadows. (PEM, ESF, MSF, P, AG)	DeGraaf and Rudis 1987
American robin	Open woodlands and woodland edges, fields, orchards, and residential areas. (PFO, PSS, MSF, UF, AG)	DeGraaf and Rudis 1987
Red fox	Intermixed croplands, fields, shrubby areas, and wooded habitats. Use habitat edges heavily. (ESF, MSF, P, UF, AG)	Samuel and Nelson 1982; DeGraaf and Rudis 1987
Mink	Utilizes stream and river banks, lake shores, and freshwater marshes. Favors forested wetlands adjacent to stream channels (riparian areas) containing abundant cover. (PFO, PSS, PEM)	Allen 1986; DeGraaf and Rudis 1987

Habitat types:

AG	Agricultural	P	Pasture	UF	Upland Forest
ESF	Early Successional Field	PEM	Palustrine Emergent		
MSF	Mid Successional Field	PFO	Palustrine Forested		
OW	Open Water	PSS	Palustrine Scrub/Shrub		

TABLE 9
MFLBC Floodplain Samples, Associated Habitats and Indicator Species **Sheet 1 of 6**

Transect	Sample	Wetland Habitat Types[a]	Indicator Species[c]	Upland Habitat Types[b]	Indicator Species[c]
Phase III Transects					
08A	95-08A-01	PFO	GBHE; AMRO; MINK	---	NOHA; REFO
	95-08A-02	PFO		---	
	95-08A-03	---		ESF	
08B	95-08B-01	PFO	GBHE; AMRO; MINK	---	AMRO
	95-08B-02	PFO		---	
	95-08B-03	---		UF	
10	95-10-01	PFO	GBHE; AMRO; MINK	---	Not applicable
	95-10-02	PSS		---	
	95-10-03	PSS		---	
11	95-11-01	---	GBHE; AMRO; MINK	UF	AMRO
	95-11-02	---		UF	
	95-11-03	PFO		---	
12	95-12-01	No bordering wetlands	GBHE; BEKI	P	NOHA; REFO
	95-12-02	No bordering wetlands		P	
	95-12-03	No bordering wetlands		P	
	95-12-04	No bordering wetlands		P	

TABLE 9
MFLBC Floodplain Samples, Associated Habitats and Indicator Species **Sheet 2 of 6**

Transect	Sample	Wetland Habitat Types[a]	Indicator Species[c]	Upland Habitat Types[b]	Indicator Species[c]
14	95-14-01	PFO	GBHE; AMRO; MINK	---	Not applicable
	95-14-02	PSS		---	
	95-14-03	PSS		---	
23	95-23-01	PEM	GBHE; SORA; VIRA; NOHA; AMRO; MINK	---	Not applicable
	95-23-02	PEM		---	
	95-23-03	PSS		---	
	95-23-04	PSS		---	
24	95-24-01	---	GBHE; SORA; VIRA; NOHA; MINK	ESF	NOHA; REFO
	95-24-02	PEM		---	
	95-24-03	PEM		---	
26A	95-26A-01	---	GBHE; AMRO; MINK	ESF; MSF	NOHA; REFO
	95-26A-02	PSS		---	
	95-26A-03	PSS		---	
26B	95-26B-01	PSS	GBHE; AMRO; MINK	---	NOHA; REFO
	95-26B-02	PSS		---	
	95-26B-03	---		AG	

TABLE 9

MFLBC Floodplain Samples, Associated Habitats and Indicator Species **Sheet 3 of 6**

Transect	Sample	Wetland Habitat Types[a]	Indicator Species[c]	Upland Habitat Types[b]	Indicator Species[c]
Existing Transects					
09	93-09-01	PSS	GBHE; AMRO; MINK	---	NOHA; AMRO; REFO
	93-09-02	---		UF	
	93-09-03	---		AG	
	93-09-04	PSS		---	
	93-09-05	---		AG	
	93-09-06	PSS		---	
	93-09-07	PSS		---	
	93-09-08	PSS		---	
	93-09-09	---		AG	
	93-09-10	PSS		---	
12	91-12-01	---	GBHE; AMRO; MINK	P	NOHA; REFO
	91-12-02	PFO		---	
	91-12-03	---		AG	
	91-12-04	---		AG	

TABLE 9
MFLBC Floodplain Samples, Associated Habitats and Indicator Species Sheet 4 of 6

Transect	Sample	Wetland Habitat Types[a]	Indicator Species[c]	Upland Habitat Types[b]	Indicator Species[c]
15	93-15-01	---	GBHE; AMRO; SORA; VIRA; NOHA; MINK	AG	NOHA; AMRO; REFO
	93-15-02	---		AG	
	93-15-03	PFO		---	
	93-15-04	---		AG	
	93-15-05	---		AG	
	93-15-06	---		UF	
	93-15-07	PEM		---	
	93-15-08	---		MSF	
	93-15-09	---		MSF	
	93-15-10	---		MSF	
	93-15-11	---		MSF	
	93-15-12	---		MSF	
	93-15-13	---		MSF	
	93-15-14	---		MSF	
	93-15-15	---		MSF	

TABLE 9

MFLBC Floodplain Samples, Associated Habitats and Indicator Species **Sheet 5 of 6**

Transect	Sample	Wetland Habitat Types[a]	Indicator Species[c]	Upland Habitat Types[b]	Indicator Species[c]
17	91-17-01	No bordering wetlands	GBHE; BEKI	AG	NOHA; REFO
	91-17-02	No bordering wetlands		AG	
	91-17-03	No bordering wetlands		AG	
	91-17-04	No bordering wetlands		AG	
Egypt Swamp	Multiple	PEM; PFO; PSS	GBHE; SORA; VIRA; NOHA; AMRO; MINK	AG; UF	NOHA; AMRO; REFO
27	91-27-01	---	GBHE; AMRO; MINK	AG	NOHA; REFO
	91-27-02	---		AG	
	91-27-03	PSS		---	
	91-27-04	PSS		---	
28	91-28-01	PSS	GBHE; SORA; VIRA; NOHA; AMRO; MINK	---	AMRO
	91-28-02	PSS		---	
	91-28-03	PSS		---	
	91-28-04	---		UF	
	91-28-05	PSS		---	
	91-28-06	PSS		---	
	91-28-07	PFO		---	
	91-28-08	PSS		---	

TABLE 9

MFLBC Floodplain Samples, Associated Habitats and Indicator Species **Sheet 6 of 6**

Transect	Sample	Wetland Habitat Types[a]	Indicator Species[c]	Upland Habitat Types[b]	Indicator Species[c]
	91-28-09	---		UF	
	91-28-10	PFO		---	
	91-28-11	---		UF	
	91-28-12	PFO		---	
	91-28-13	PSS		---	
	91-28-14	---		UF	
	91-28-15	PSS		---	
	91-28-16	PEM		---	
	91-28-17	---		UF	
	91-28-18	PFO		---	
	91-28-19	PEM		---	
	91-28-20	PSS		---	

[a] PFO - Palustrine Forested; PSS - Palustrine Scrub-shrub; PEM - Palustrine Emergent.

[b] ESF - Early Successional Field; MSF - Mid Successional Field; AG - Agricultural; P - Pasture; UF - Upland Forest.

[c] GBHE - Great blue heron; BEKI - Belted kingfisher; VIRA - Virginia rail; SORA - Sora; AMRO - American robin; NOHA - Northern Harrier; REFO - Red fox; MINK - Mink.

TABLE 10

Sampling Locations Across Indicator Species Habitats
Summary of Phase III and Existing MFLBC Floodplain Soil and Sediment Transects
Stations 1 through 31

Indicator Species	MFLBC Habitat Type	Transect Samples in Appropriate Floodplain Habitat			Samples in Open Water Habitat	
		Phase III	Existing	Total	Phase III	Existing
Great blue heron	PFO, PSS, PEM, OW	25	48	73	4	39
Belted kingfisher	OW	NA	NA	NA	4	39
Sora	PEM, OW	8	12	20	4	39
Virginia rail	PEM, OW	8	12	20	4	39
Northern harrier	PEM, ESF, MSF, P, AG	13	37	50	NA	NA
American robin	PFO, PSS, MSF, UF, AG	22	66	88	NA	NA
Red fox	ESF, MSF, P, UF, AG	12	32	44	NA	NA
Mink	PFO, PSS, PEM	21	48	69	NA	NA

NOTES:

NA - Not Applicable. Species does not forage extensively in the habitat concerned.

Habitat Types:
AG Agricultural
ESF Early Successional Field
MSF Mid Successional Field
OW Open Water
P Pasture
PEM Palustrine Emergent
PFO Palustrine Forested
PSS Palustrine Scrub/Shrub
UF Upland Forest

Table 11
Sampling Parameters For Floodplain Transect Stations and Metals Sampling Stations
MFLBC Phase III
Nease Site, Salem, Ohio

Sample Station	Sampling Date	Sample Location RNC ID/Laboratory ID	Parameters Analyzed	QA/QC Samples	Shipping Date
SD95-M-1	9/6/95	SD95-M-1	TAL Metals		9/7/95
SD95-M-2	9/6/95	SD95-M-2	TAL Metals	SD95-M-5FD: field duplicate (sed)	9/7/95
SD95-M-3	9/6/95	SD95-M-3	TAL Metals		9/7/95
SD95-M-4	9/6/95	SD95-M-4	TAL Metals		9/7/95
SD95-M-5	9/6/95	SD95-M-5	TAL Metals	RB95-M-5: rinsate blank (sed)	9/7/95
SD95-M-6	9/5/95	SD95-M-6	TAL Metals		9/7/95
SD95-M-7	9/5/95	SD95-M-7	TAL Metals		9/7/95
SD95-M-8	9/5/95	SD95-M-8	TAL Metals	SD95-M-8: MS/MSD (sed)	9/7/95
SD95-M-9	9/13/95	SD95-M-9	TAL Metals		9/14/95
SS/SD95-08A	9/13/95	SD95-08A-01	MPK, TOC, GS	RB95-08A-01: MPK - rinsate blank (sed)	9/14/95
SD95-M-10		SS95-08A-01	MPK, TOC, GS		
		SS95-08A-02	MPK, TOC, GS		
		SS95-08A-03	MPK, TOC, GS		
		SD95-M-10	TAL Metals		
SS/SD95-08B	9/13/95	SD95-08B-01	MPK, TOC, GS, SVOC	SD95-08B-01FD: SVOC,MPK-field duplicate (sed)	9/14/95
		SS95-08B-01	MPK, TOC, GS, SVOC		
		SS95-08B-02	MPK, TOC, GS, SVOC	SS95-08B-02: SVOC - MS/MSD (soil)	
		SS95-08B-03	MPK, TOC, GS, SVOC		
SS/SD95-10	9/12/95	SD95-10-01	MPK, TOC, GS, SVOC	RB95-10-01: SVOC-rinsate blank (sed)	9/12/95
SD95-M-11		SS95-10-01	MPK, TOC, GS, SVOC		
		SS95-10-02	MPK, TOC, GS, SVOC	SS95-10-02FD: SVOC-field duplicate (soil)	
		SS95-10-03	MPK, TOC, GS, SVOC		
		SD95-M-11	TAL Metals		

Table 11
Sampling Parameters For Floodplain Transect Stations and Metals Sampling Stations
MFLBC Phase III
Nease Site, Salem, Ohio

Sample Station	Shipping Date	Sample Location RNC ID/Laboratory ID	Parameters	QA/QC Samples	Shipping Date
SS95-11	9/12/95	SS95-11-01	MPK, TOC, GS	SS95-11-01: MPK-MS/MSD (soil)	9/12/95
		SS95-11-02	MPK, TOC, GS		
		SS95-11-03	MPK, TOC, GS		
SS/SD95-12	9/11/95	SD95-12-01	MPK, TOC, GS, SVOC	SD95-12-01FD: SVOC, MPK-field duplicate (sed)	9/12/95
		SS95-12-01	MPK, TOC, GS, SVOC		
		SS95-12-02	MPK, TOC, GS, SVOC		
		SS95-12-03	MPK, TOC, GS, SVOC	RB95-12-03: SVOC-rinsate blank (soil)	
		SS95-12-04	MPK, TOC, GS, SVOC		
SS95-14	9/7/95	SS95-14-01	MPK, TOC, GS	SS95-14-01: MPK-field duplicate (soil)	9/7/95
		SS95-14-02	MPK, TOC, GS		
		SS95-14-03	MPK, TOC, GS		
SS95-23	9/8/95	SS95-23-01	MPK, TOC, GS		9/12/95
		SS95-23-02	MPK, TOC, GS	RB95-23-02: MPK-rinsate blank (soil)	
		SS95-23-03	MPK, TOC, GS		
		SS95-23-04	MPK, TOC, GS		
SS95-24	9/7/95	SS95-24-01	MPK, TOC, GS	SS95-24-01: MPK-MS/MSD (soil)	9/7/95
		SS95-24-02	MPK, TOC, GS		
		SS95-24-03	MPK, TOC, GS		
SS95-26A	9/11/95	SS95-26A-01	MPK, TOC, GS		9/12/95
		SS95-26A-02	MPK, TOC, GS	SS95-26A-02FD: MPK-field duplicate (soil)	
		SS95-26A-03	MPK, TOC, GS		
SS95-26B	9/10/95	SS95-26B-01	MPK, TOC, GS		9/12/95
		SS95-26B-02	MPK, TOC, GS		
		SS95-26B-03	MPK, TOC, GS	RB95-26B03: MPK-rinsate blank (soil)	

TABLE 11A
USEPA SPLIT SAMPLES
MFLBC - Phase III
Nease Site, Salem, Ohio

Oversight Sample ID	RNC Sample ID	Date Sampled	Analyses
RNC-ST2-001	SD95-M-2	9/6/95	TAL Metals
RNC-ST4-001	SD95-M-4	9/6/95	TAL Metals
RNC-ST5-001	SD95-M-5	9/6/95	TAL Metals
RNC-ST5-101 (oversight field duplicate)	SD95-M-5	9/6/95	TAL Metals
RNC-ST10-001	SD95-10-01		
RNC-ST10-101	SD95-10-01	9/12/95	MPK and SVOC
RNC-ST12-001	SD95-12-01	9/11/95	MPK and SVOC
RNC-ST12-101 (oversight field duplicate)	SD95-12-01	9/11/95	MPK and SVOC
RNC-SS12-001	SS95-12-02	9/11/95	MPK and SVOC
RNC-SS12-002	SS95-12-04	9/11/95	MPK and SVOC
RNC-SS12-102 (oversight field duplicate)	SS95-12-04FD (RNC field duplicate)	9/11/95	MPK and SVOC
RNC-SS14-001	SS95-14-02	9/7/95	MPK only
RNC-SS14-101 (oversight field duplicate)	SS95-14-02	9/7/95	MPK only
RNC-SS14-002	SS95-14-03	9/7/95	MPK only
RNC-SS24-001	SS95-24-02	9/7/95	MPK only
RNC-SS24-002	SS95-24-03	9/7/95	MPK only
RNC-SS26-001	SD95-26B-01	9/10/95	MPK only

Split samples collected by Black and Veatch.
Analyses performed by Skinner and Sherman Analytical Laboratory.

SUMMARY OF DETECTED CONCENTRATIONS

TCL Semivolatile Organics

MFLBC Phase III

Nease Site, Salem, Ohio

Matrix: Floodplain Soil

Parameter	Sample Point SS95-10-01 Lab ID: L9165-6 Date Sampled: 9/12/95		Sample Point SS95-10-02 Lab ID: L9165-7 Date Sampled: 9/12/95		Sample Point SS95-10-02FD Lab ID: L9165-23 Date Sampled: 9/12/95		Sample Point SS95-10-03 Lab ID: L9165-8 Date Sampled: 9/12/95		Sample Point SS95-12-01 Lab ID: L9165-11 Date Sampled: 9/11/95	
	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Benzoic acid	---	---	---	---	---	---	290	J	---	---
Phenanthrene	210	J	290	J	330	J	---	---	---	---
Fluoranthene	410		420		470		---	---	240	J
Pyrene	350	J	340	J	370		---	---	190	J
Benzo(a)Anthracene	210	J	190	J	200	J	---	---	---	---
Chrysene	250	J	220	J	220	J	---	---	---	---
Benzo(b)Fluoranthene	360	J	210	J	240	J	---	---	---	---
Benzo(a)Pyrene	240	J	---	---	---	---	---	---	---	---

Notes:

All units are µg/Kg.

Sample points are identified by unique sets of characters. Each character set is divided into three sections. The first section indicates the medium - sediment (SD), floodplain soil (SS), or Rinsate Blank (RB), and the year sampled (95). The second section indicates the transect number. The third section indicates the sample location number along the transect. In some cases, the third section contains the letters FD, which indicate a field duplicate.

Floodplain soil samples collected during MFLBC Phase III were not analyzed for TAL Inorganics.

--- indicates not detected.

Qual column indicates qualifier applied to the result following data validation (see below). In this table, only detected results (unqualified results [blank space in Qual column], or J - qualified results) are show

(blank space) - Acceptable (Quantitative) Data J - Estimated (Subquantitative) Data

SUMMARY OF DETECTED CONCENTRATIONS

TCL Semivolatile Organics

MFLBC Phase III

Nease Site, Salem, Ohio

Matrix: Floodplain Soil

Parameter	Sample Point SS95-12-02 Lab ID: L9165-12 Date Sampled: 9/11/95		Sample Point Lab ID: Date Sampled:		Sample Point Lab ID: Date Sampled:		Sample Point Lab ID: Date Sampled:		Sample Point Lab ID: Date Sampled:	
	Result	Qual	Result		Result		Result		Result	
Benzoic acid	---	---								
Phenanthrene	---	---								
Fluoranthene	220	J								
Pyrene	---	---								
Benzo(a)Anthracene	---	---								
Chrysene	---	---								
Benzo(b)Fluoranthene	---	---								
Benzo(a)Pyrene	---	---								

Notes:

All units are µg/Kg.

Sample points are identified by unique sets of characters. Each character set is divided into three sections. The first section indicates the medium - sediment (SD), floodplain soil (SS), or Rinsate Blank (RB), and the year sampled (95). The second section indicates the transect number. The third section indicates the sample location number along the transect. In some cases, the third section contains the letters FD, which indicate a field duplicate.

Floodplain soil samples collected during MFLBC Phase III were not analyzed for TAL Inorganics.

--- indicates not detected.

Qual column indicates qualifier applied to the result following data validation (see below). In this table, only detected results (unqualified results [blank space in Qual column], or J - qualified results) are show

{blank space} - Acceptable (Quantitative) Data J - Estimated (Subquantitative) Data

SUMMARY OF DETECTED CONCENTRATIONS

Mirex, Photomirex, Kepone

MFLBC Phase III

Nease Site, Salem, Ohio

Matrix: Floodplain Soil

Parameter	Sample Point SS95-08A-01 Lab ID: L9189-5 Date Sampled: 9/13/95		Sample Point SS95-08B-03 Lab ID: L9189-4 Date Sampled: 9/13/95		Sample Point SS95-10-01 Lab ID: L9165-6 Date Sampled: 9/12/95		Sample Point SS95-10-02 Lab ID: L9165-7 Date Sampled: 9/12/95		Sample Point SS95-10-02FD Lab ID: L9165-23 Date Sampled: 9/12/95	
	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Mirex	177		34.0		294		174		94.7	
Photomirex	---	---	---	---	95.6		66.1		43.5	
Kepone	---	---	---	---	135		70.4		51.3	

Notes:

All units are µg/Kg (dry weight).

Sample points are identified by unique sets of characters. Each character set is divided into three sections. The first section indicates the medium - sediment (SD), floodplain soil (SS), or Rinsate Blank (RB), and the year sampled (95). The second section indicates the transect number. The third section indicates the sample location number along the transect. In some cases, the third section contains the letters FD, which indicate a field duplicate.

Floodplain soil samples collected during MFLBC Phase III were not analyzed for TAL Inorganics.

--- indicates not detected.

Qual column indicates qualifier applied to the result following data validation (see below). In this table, only detected results (unqualified results [blank space in Qual column], or J - qualified results) are show

{blank space} - Acceptable (Quantitative) Data J - Estimated (Subquantitative) Data

SUMMARY OF DETECTED CONCENTRATIONS

Mirex, Photomirex, Kepone

MFLBC Phase III

Nease Site, Salem, Ohio

Matrix: Floodplain Soil

Parameter	Sample Point SS95-10-03 Lab ID: L9165-8 Date Sampled: 9/12/95		Sample Point SS95-11-01 Lab ID: L9165-1 Date Sampled: 9/12/95		Sample Point SS95-11-02 Lab ID: L9165-2 Date Sampled: 9/12/95		Sample Point SS95-12-01 Lab ID: L9165-11 Date Sampled: 9/11/95		Sample Point SS95-12-02 Lab ID: L9165-12 Date Sampled: 9/11/95	
	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Mirex	31.1		20.3		100		148		111	
Photomirex	---	---	---	---	4.4		212		108	
Kepone	---	---	---	---	5.0	J	169		193	

Notes:

All units are µg/Kg (dry weight).

Sample points are identified by unique sets of characters. Each character set is divided into three sections. The first section indicates the medium - sediment (SD), floodplain soil (SS), or Rinsate Blank (RB), and the year sampled (95). The second section indicates the transect number. The third section indicates the sample location number along the transect. In some cases, the third section contains the letters FD, which indicate a field duplicate.

Floodplain soil samples collected during MFLBC Phase III were not analyzed for TAL Inorganics.

--- indicates not detected.

Qual column indicates qualifier applied to the result following data validation (see below). In this table, only detected results (unqualified results [blank space in Qual column], or J - qualified results) are show

{blank space} - Acceptable (Quantitative) Data J - Estimated (Subquantitative) Data

TABLE 12a

SUMMARY OF DETECTED CONCENTRATIONS

Mirex, Photomirex, Kepone

MFLBC Phase III

Nease Site, Salem, Ohio

Matrix: Floodplain Soil

Parameter	Sample Point SS95-12-03 Lab ID: L9165-14 Date Sampled: 9/11/95		Sample Point SS95-12-04 Lab ID: L9165-15 Date Sampled: 9/11/95		Sample Point SS95-14-01 Lab ID: L9121-13 Date Sampled: 9/7/95		Sample Point SS95-14-01FD Lab ID: L9121-14 Date Sampled: 9/7/95		Sample Point SS95-14-02 Lab ID: L9121-12 Date Sampled: 9/7/95	
	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Mirex	198		130		156		186		350	
Photomirex	5.5		112		10.5		10.8		58.0	
Kepone	---	---	118		12.8		16.0		179	

Notes:

All units are µg/Kg (dry weight).

Sample points are identified by unique sets of characters. Each character set is divided into three sections. The first section indicates the medium - sediment (SD), floodplain soil (SS), or Rinsate Blank (RB), and the year sampled (95). The second section indicates the transect number. The third section indicates the sample location number along the transect. In some cases, the third section contains the letters FD, which indicate a field duplicate.

Floodplain soil samples collected during MFLBC Phase III were not analyzed for TAL Inorganics.

--- indicates not detected.

Qual column indicates qualifier applied to the result following data validation (see below). In this table, only detected results (unqualified results [blank space in Qual column], or J - qualified results) are show

{blank space} - Acceptable (Quantitative) Data J - Estimated (Subquantitative) Data

SUMMARY OF DETECTED CONCENTRATIONS

Mirex, Photomirex, Kepone

MFLBC Phase III

Nease Site, Salem, Ohio

Matrix: Floodplain Soil

Parameter	Sample Point SS95-14-03 Lab ID: L9121-11 Date Sampled: 9/7/95		Sample Point SS95-23-01 Lab ID: L9124-6 Date Sampled: 9/8/95		Sample Point SS95-23-02 Lab ID: L9124-7 Date Sampled: 9/8/95		Sample Point SS95-24-01 Lab ID: L9124-1 Date Sampled: 9/7/95		Sample Point SS95-24-02 Lab ID: L9124-2 Date Sampled: 9/7/95	
	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Mirex	25.7		44.4		346		---	---	39.9	
Photomirex	---	---	3.5		3.6		55.8		---	---
Kepone	---	---	---	---	---	---	81.6		---	---

Notes:

All units are µg/Kg (dry weight).

Sample points are identified by unique sets of characters. Each character set is divided into three sections. The first section indicates the medium - sediment (SD), floodplain soil (SS), or Rinsate Blank (RB), and the year sampled (95). The second section indicates the transect number. The third section indicates the sample location number along the transect. In some cases, the third section contains the letters FD, which indicate a field duplicate.

Floodplain soil samples collected during MFLBC Phase III were not analyzed for TAL Inorganics.

--- indicates not detected.

Qual column indicates qualifier applied to the result following data validation (see below). In this table, only detected results (unqualified results [blank space in Qual column], or J - qualified results) are show

{blank space} - Acceptable (Quantitative) Data J - Estimated (Subquantitative) Data

TABLE 12a

SUMMARY OF DETECTED CONCENTRATIONS

Mirex, Photomirex, Kepone

MFLBC Phase III

Nease Site, Salem, Ohio

Matrix: Floodplain Soil

Parameter	Sample Point SS95-24-03 Lab ID: L9124-3 Date Sampled: 9/7/95		Sample Point SS95-26A-01 Lab ID: L9165-9 Date Sampled: 9/11/95		Sample Point SS95-26A-02 Lab ID: L9165-10 Date Sampled: 9/11/95		Sample Point SS95-26A-02FD Lab ID: L9165-19 Date Sampled: 9/11/95		Sample Point SS95-26B-01 Lab ID: L9165-20 Date Sampled: 9/10/95	
	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Mirex	75.2		54.8		247		243		334	
Photomirex	---	---	---	---	30.2		29.1		8.0	
Kepone	---	---	---	---	42.2		48.0		4.8	

Notes:

All units are µg/Kg (dry weight).

Sample points are identified by unique sets of characters. Each character set is divided into three sections. The first section indicates the medium - sediment (SD), floodplain soil (SS), or Rinsate Blank (RB), and the year sampled (95). The second section indicates the transect number. The third section indicates the sample location number along the transect. In some cases, the third section contains the letters FD, which indicate a field duplicate.

Floodplain soil samples collected during MFLBC Phase III were not analyzed for TAL Inorganics.

--- indicates not detected.

Qual column indicates qualifier applied to the result following data validation (see below). In this table, only detected results (unqualified results [blank space in Qual column], or J - qualified results) are show

{blank space} - Acceptable (Quantitative) Data J - Estimated (Subquantitative) Data

SUMMARY OF DETECTED CONCENTRATIONS

Mirex, Photomirex, Kepone

MFLBC Phase III

Nease Site, Salem, Ohio

Matrix: Floodplain Soil

Parameter	Sample Point SS95-26B-02 Lab ID: L9165-21 Date Sampled: 9/10/95		Sample Point SS95-26B-03 Lab ID: L9165-22 Date Sampled: 9/10/95		Sample Point Lab ID: Date Sampled:		Sample Point Lab ID: Date Sampled:		Sample Point Lab ID: Date Sampled:	
	Result	Qual	Result	Qual	Result		Result		Result	
Mirex	157		118							
Photomirex	39.1		26.4							
Kepone	68.0		57.9							

Notes:

All units are µg/Kg (dry weight).

Sample points are identified by unique sets of characters. Each character set is divided into three sections. The first section indicates the medium - sediment (SD), floodplain soil (SS), or Rinsate Blank (RB), and the year sampled (95). The second section indicates the transect number. The third section indicates the sample location number along the transect. In some cases, the third section contains the letters FD, which indicate a field duplicate.

Floodplain soil samples collected during MFLBC Phase III were not analyzed for TAL Inorganics.

--- indicates not detected.

Qual column indicates qualifier applied to the result following data validation (see below). In this table, only detected results (unqualified results [blank space in Qual column], or J - qualified results) are show

{blank space} - Acceptable (Quantitative) Data J - Estimated (Subquantitative) Data

SUMMARY OF DETECTED CONCENTRATIONS

Mirex, Photomirex, Kepone

MFLBC Phase III

Nease Site, Salem, Ohio

Matrix: Sediment

Parameter	Sample Point SD95-10-01 Lab ID: L9165-4 Date Sampled: 9/12/95		Sample Point SD95-12-01 Lab ID: L9165-13 Date Sampled: 9/11/95		Sample Point SD95-12-01FD Lab ID: L9165-17 Date Sampled: 9/11/95		Sample Point Lab ID: Date Sampled:		Sample Point Lab ID: Date Sampled:	
	Result	Qual	Result	Qual	Result	Qual	Result		Result	
Mirex	344		178		277					

Notes:

All units are µg/Kg (dry weight).

Sample points are identified by unique sets of characters. Each character set is divided into three sections. The first section indicates the medium - sediment (SD), floodplain soil (SS), or Rinsate Blank (RB), and the year sampled (95). The second section indicates the transect number. The third section indicates the sample location number along the transect. In some cases, the third section contains the letters FD, which indicate a field duplicate.

--- Indicates not detected.

TCL Semivolatiles were not detected in sediment samples collected during MFLBC Phase III.

Qual column indicates qualifier applied to the result following data validation (see below). In this table, only detected results (unqualified results [blank space in Qual column], or J - qualified results) are shown.

(blank space) - Acceptable (Quantitative) Data J - Estimated (Subquantitative) Data

TABLE 12b

SUMMARY OF DETECTED CONCENTRATIONS

TAL Inorganics

MFLBC Phase III

Nease Site, Salem, Ohio

Matrix: Sediment

Parameter	Sample Point SD95-M-1 Lab ID: L9121-9 Date Sampled: 9/6/95		Sample Point SD95-M-2 Lab ID: L9121-7 Date Sampled: 9/6/95		Sample Point SD95-M-2FD Lab ID: L9121-8 Date Sampled: 9/6/95		Sample Point SD95-M-3 Lab ID: L9121-6 Date Sampled: 9/6/95		Sample Point SD95-M-4 Lab ID: L9121-5 Date Sampled: 9/6/95	
	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Aluminum	8744		9177		17660		22009		4762	
Antimony	0.28	J	1.1	J	1.8	J	2.1	J	---	---
Arsenic	8.3		12.5		19.4		28.0		15.9	
Barium	73.4	J	93.6	J	137	J	114	J	38.9	J
Beryllium	0.72	J	0.81	J	1.8	J	2.5	J	0.43	J
Cadmium	---	---	3.4	J	5.0	J	6.0	J	---	---
Calcium	2013		10813		8573		2889		8220	
Chromium	13.7	J	22.8	J	48.4	J	46.6	J	8.2	J
Cobalt	8.5		10.5	B	19.9		25.9		7.6	B
Copper	14.8	J	21.2	J	22.2	J	9.0	J	8.7	J
Iron	7976		16511		13929		10046		17630	
Lead	32.0		69.2		97.6		67.8		11.7	
Magnesium	1371		1975		1953		1271		2987	
Manganese	673	J	955	J	1712	J	1396	J	627	J
Nickel	16.4	J	29.1	J	55.2	J	65.1	J	13.4	J
Potassium	283		401		339		248		545	
Selenium	0.64	B	0.97	B	1.7		1.8		0.33	B
Silver	---	---	---	---	---	---	0.13	J	---	---
Sodium	56.1	J	106	J	82.5	J	50.0	J	53.1	J
Thallium	0.13	J	0.17	J	0.29	J	0.31	J	0.07	J
Vanadium	17.6	J	21.8	J	40.2	J	61.3	J	12.3	J
Zinc	67.8	J	154	J	275	J	267	J	45.2	J

Notes:

All units are mg/Kg.

Sample points are identified by unique sets of characters. Each character set is divided into three sections. The first section indicates the medium - sediment (SD), floodplain soil (SS), or Rinsate Blank (RB), and the year sampled (95). The second section indicates the transect number. The third section indicates the sample location number along the transect. In some cases, the third section contains the letters FD, which indicate a field duplicate.

--- indicates not detected.

Qual column indicates qualifier applied to the result following data validation (see below). In this table, only detected results (unqualified results [blank space in Qual column], J - qualified results, or B - qualified results) are shown.

{blank space} - Acceptable (Quantitative) Data J - Estimated (Subquantitative) Data B - Acceptable (Quantitative) Data between IDL and CRDL

TABLE 12b
SUMMARY OF DETECTED CONCENTRATIONS
TAL Inorganics
MFLBC Phase III
Nease Site, Salem, Ohio

Matrix: Sediment

Parameter	Sample Point SD95-M-5 Lab ID: L9121-4 Date Sampled: 9/6/95		Sample Point SD95-M-6 Lab ID: L9121-3 Date Sampled: 9/5/95		Sample Point SD95-M-7 Lab ID: L9121-2 Date Sampled: 9/5/95		Sample Point SD95-M-8 Lab ID: L9121-1 Date Sampled: 9/5/95		Sample Point SD95-M-9 Lab ID: L9189-12 Date Sampled: 9/13/95	
	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Aluminum	4804		4577		2900		3578		6346	
Antimony	---	---	0.20	J	0.27	J	0.28	J	0.29	J
Arsenic	9.0		8.2		5.8		5.0		11.4	
Barium	29.1	J	57.2	J	37.1	J	36.5	J	97.7	J
Beryllium	0.45	J	0.64	J	0.33	J	0.32	J	0.62	J
Cadmium	---	---	3.2	J	---	---	---	---	4.1	J
Calcium	2740		2329		2935		2440		10799	
Chromium	9.1	J	12.4	J	6.4	J	18.8	J	14.9	J
Cobalt	6.9	B	7.2	B	5.3	B	5.5	B	9.4	B
Copper	13.2	J	6.6	J	10.0	J	8.0	J	12.6	J
Iron	18331		20517		16768		17885		12970	
Lead	19.9		14.0		11.6		10.6		22.0	
Magnesium	1960		1304		1670		1642		1984	
Manganese	249	J	471	J	223	J	254	J	668	J
Nickel	13.9	J	19.3	J	12.3	J	14.9	J	22.5	J
Potassium	359		371		412		373		345	
Selenium	0.37	B	0.45	B	0.24	B	0.24	B	0.69	B
Silver	---	---	---	---	---	---	0.19	J	0.18	J
Sodium	82.7	J	182	J	134	J	260	J	328	J
Thallium	0.07	J	0.10	J	---	---	0.10	J	---	---
Vanadium	11.73	J	12.3	J	7.7	J	7.8	J	13.3	J
Zinc	52.8	J	70.7	J	49.3	J	58.6	J	97.2	J

Notes:

All units are mg/Kg.

Sample points are identified by unique sets of characters. Each character set is divided into three sections. The first section indicates the medium - sediment (SD), floodplain soil (SS), or Rinsate Blank (RB), and the year sampled (95). The second section indicates the transect number. The third section indicates the sample location number along the transect. In some cases, the third section contains the letters FD, which indicate a field duplicate.

--- indicates not detected.

Qual column indicates qualifier applied to the result following data validation (see below). In this table, only detected results (unqualified results [blank space in Qual column], J - qualified results, or B - qualified results) are shown.

{blank space} - Acceptable (Quantitative) Data J - Estimated (Subquantitative) Data B - Acceptable (Quantitative) Data between IDL and CRDL

TABLE 12b

SUMMARY OF DETECTED CONCENTRATIONS

TAL Inorganics

MFLBC Phase III

Nease Site, Salem, Ohio

Matrix: Sediment

Parameter	Sample Point SD95-M-10 Lab ID: L9189-11 Date Sampled: 9/13/95		Sample Point SD95-M-11 Lab ID: L9165-5 Date Sampled: 9/12/95		Sample Point Lab ID: Date Sampled:		Sample Point Lab ID: Date Sampled:		Sample Point Lab ID: Date Sampled:	
	Result	Qual	Result	Qual	Result		Result		Result	
Aluminum	7917		2908							
Antimony	0.77	J	---	---						
Arsenic	8.8		5.8							
Barium	55.9	J	27.9	J						
Beryllium	0.62	J	0.26	J						
Cadmium	3.7	J	1.5							
Calcium	1656		2008							
Chromium	21.4	J	7.7	J						
Cobalt	10.8		4.7	B						
Copper	5.9	J	9.8	J						
Iron	7255		13881							
Lead	22.0		8.6							
Magnesium	939		1359							
Manganese	363	J	232	J						
Nickel	35.2	J	15.6	J						
Potassium	204		256							
Selenium	0.66	B	0.23	B						
Silver	0.31	J	---	---						
Sodium	230	J	106	J						
Thallium	0.13	J	0.05	J						
Vanadium	17.4	J	7.9	J						
Zinc	139	J	47.1	J						

Notes:

All units are mg/Kg.

Sample points are identified by unique sets of characters. Each character set is divided into three sections. The first section indicates the medium - sediment (SD), floodplain soil (SS), or Rinsate Blank (RB), and the year sampled (95). The second section indicates the transect number. The third section indicates the sample location number along the transect. In some cases, the third section contains the letters FD, which indicate a field duplicate.

--- indicates not detected.

Qual column indicates qualifier applied to the result following data validation (see below). In this table, only detected results (unqualified results [blank space in Qual column], J - qualified results, or B - qualified results) are shown.

(blank space) - Acceptable (Quantitative) Data J - Estimated (Subquantitative) Data B - Acceptable (Quantitative) Data between IDL and CRDL

TABLE 13

ANALYTICAL CHEMISTRY RESULTS

MFLBC Phase III - TOC & Percent Fines

Nease Site, Salem, Ohio

Matrix: Floodplain Soil

	Sample Point SS95-08A-01 Lab ID: L9189-5 Date Sampled: 9/13/95	Sample Point SS95-08A-02 Lab ID: L9189-7 Date Sampled: 9/13/95	Sample Point SS95-08A-03 Lab ID: L9189-8 Date Sampled: 9/13/95	Sample Point SS95-08B-01 Lab ID: L9189-2 Date Sampled: 9/13/95	Sample Point SS95-08B-02 Lab ID: L9189-3 Date Sampled: 9/13/95
Parameter	Result	Result	Result	Result	Result
Total Organic Carbon	4200 mg/Kg	4200 mg/Kg	3900 mg/Kg	1500 mg/Kg	3600 mg/Kg
Percent Fines	88.2 %	79.5 %	65.0 %	40.3 %	81.4 %

Notes:

Percent Fines is the percentage of silt and clay sized particles contained in the sample. Grain size analysis results are reported in the Description of Soils table.

Sample points are identified by unique sets of characters. Each character set is divided into three sections. The first section indicates the medium - sediment (SD), floodplain soil (SS), or Rinsate Blank (RB), and the year sampled (95). The second section indicates the transect number. The third section indicates the sample location number along the transect. In some cases, the third section contains the letters FD, which indicate a field duplicate.

ANALYTICAL CHEMISTRY RESULTS

MFLBC Phase III - TOC & Percent Fines

Nease Site, Salem, Ohio

Matrix: Floodplain Soil

	Sample Point SS95-08B-03 Lab ID: L9189-4 Date Sampled: 9/13/95	Sample Point SS95-10-01 Lab ID: L9165-6 Date Sampled: 9/12/95	Sample Point SS95-10-02 Lab ID: L9165-7 Date Sampled: 9/12/95	Sample Point SS95-10-02FD Lab ID: L9165-23 Date Sampled: 9/12/95	Sample Point SS95-10-03 Lab ID: L9165-8 Date Sampled: 9/12/95
Parameter	Result	Result	Result	Result	Result
Total Organic Carbon	6600 mg/Kg	5300 mg/Kg	1700 mg/Kg	1900 mg/Kg	5100 mg/Kg
Percent Fines	90.7 %	81.9 %	38.7 %	40.2 %	87.2 %

Notes:

Percent Fines is the percentage of silt and clay sized particles contained in the sample. Grain size analysis results are reported in the Description of Soils table.

Sample points are identified by unique sets of characters. Each character set is divided into three sections. The first section indicates the medium - sediment (SD), floodplain soil (SS), or Rinsate Blank (RB), and the year sampled (95). The second section indicates the transect number. The third section indicates the sample location number along the transect. In some cases, the third section contains the letters FD, which indicate a field duplicate.

TABLE 13

ANALYTICAL CHEMISTRY RESULTS

MFLBC Phase III - TOC & Percent Fines

Nease Site, Salem, Ohio

Matrix: Floodplain Soil

	Sample Point SS95-11-01 Lab ID: L9165-1 Date Sampled: 9/12/95	Sample Point SS95-11-02 Lab ID: L9165-2 Date Sampled: 9/12/95	Sample Point SS95-11-03 Lab ID: L9165-3 Date Sampled: 9/12/95	Sample Point SS95-12-01 Lab ID: L9165-11 Date Sampled: 9/11/95	Sample Point SS95-12-02 Lab ID: L9165-12 Date Sampled: 9/11/95
Parameter	Result	Result	Result	Result	Result
Total Organic Carbon	3800 mg/Kg	1400 mg/Kg	700 mg/Kg	1900 mg/Kg	2900 mg/Kg
Percent Fines	65.6 %	66.2 %	55.9 %	52.1 %	58.1 %

Notes:

Percent Fines is the percentage of silt and clay sized particles contained in the sample. Grain size analysis results are reported in the Description of Soils table.

Sample points are identified by unique sets of characters. Each character set is divided into three sections. The first section indicates the medium - sediment (SD), floodplain soil (SS), or Rinsate Blank (RB), and the year sampled (95). The second section indicates the transect number. The third section indicates the sample location number along the transect. In some cases, the third section contains the letters FD, which indicate a field duplicate.

ANALYTICAL CHEMISTRY RESULTS
MFLBC Phase III - TOC & Percent Fines
Nease Site, Salem, Ohio

Matrix: Floodplain Soil

	Sample Point SS95-12-03 Lab ID: L9165-14 Date Sampled: 9/11/95	Sample Point SS95-12-04 Lab ID: L9165-15 Date Sampled: 9/11/95	Sample Point SS95-14-01 Lab ID: L9121-13 Date Sampled: 9/7/95	Sample Point SS95-14-01FD Lab ID: L9121-14 Date Sampled: 9/7/95	Sample Point SS95-14-02 Lab ID: L9121-12 Date Sampled: 9/7/95
Parameter	Result	Result	Result	Result	Result
Total Organic Carbon	600 mg/Kg	1900 mg/Kg	3500 mg/Kg	6100 mg/Kg	2800 mg/Kg
Percent Fines	11.8 %	47.3 %	83.7 %	82.2 %	69.6 %

Notes:

Percent Fines is the percentage of silt and clay sized particles contained in the sample. Grain size analysis results are reported in the Description of Soils table.

Sample points are identified by unique sets of characters. Each character set is divided into three sections. The first section indicates the medium - sediment (SD), floodplain soil (SS), or Rinsate Blank (RB), and the year sampled (95). The second section indicates the transect number. The third section indicates the sample location number along the transect. In some cases, the third section contains the letters FD, which indicate a field duplicate.

ANALYTICAL CHEMISTRY RESULTS

MFLBC Phase III - TOC & Percent Fines

Nease Site, Salem, Ohio

Matrix: Floodplain Soil

	Sample Point SS95-14-03 Lab ID: L9121-11 Date Sampled: 9/7/95	Sample Point SS95-23-01 Lab ID: L9124-6 Date Sampled: 9/8/95	Sample Point SS95-23-02 Lab ID: L9124-7 Date Sampled: 9/8/95	Sample Point SS95-23-03 Lab ID: L9124-4 Date Sampled: 9/8/95	Sample Point SS95-23-04 Lab ID: L9124-5 Date Sampled: 9/8/95
Parameter	Result	Result	Result	Result	Result
Total Organic Carbon	4500 mg/Kg	7200 mg/Kg	6300 mg/Kg	3000 mg/Kg	3200 mg/Kg
Percent Fines	90.8 %	80.9 %	91.4 %	64.8 %	80.4 %

Notes:

Percent Fines is the percentage of silt and clay sized particles contained in the sample. Grain size analysis results are reported in the Description of Soils table.

Sample points are identified by unique sets of characters. Each character set is divided into three sections. The first section indicates the medium - sediment (SD), floodplain soil (SS), or Rinsate Blank (RB), and the year sampled (95). The second section indicates the transect number. The third section indicates the sample location number along the transect. In some cases, the third section contains the letters FD, which indicate a field duplicate.

TABLE 13

ANALYTICAL CHEMISTRY RESULTS

MFLBC Phase III - TOC & Percent Fines

Nease Site, Salem, Ohio

Matrix: Floodplain Soil

	Sample Point SS95-24-01 Lab ID: L9124-1 Date Sampled: 9/8/95	Sample Point SS95-24-02 Lab ID: L9124-2 Date Sampled: 9/8/95	Sample Point SS95-24-03 Lab ID: L9124-3 Date Sampled: 9/8/95	Sample Point SS95-26A-01 Lab ID: L9165-9 Date Sampled: 9/11/95	Sample Point SS95-26A-02 Lab ID: L9165-10 Date Sampled: 9/11/95
Parameter	Result	Result	Result	Result	Result
Total Organic Carbon	6200 mg/Kg	2900 mg/Kg	14600 mg/Kg	7300 mg/Kg	5900 mg/Kg
Percent Fines	82.9 %	39.4 %	87.7 %	81.2 %	93.3 %

Notes:

Percent Fines is the percentage of silt and clay sized particles contained in the sample. Grain size analysis results are reported in the Description of Soils table.

Sample points are identified by unique sets of characters. Each character set is divided into three sections. The first section indicates the medium - sediment (SD), floodplain soil (SS), or Rinsate Blank (RB), and the year sampled (95). The second section indicates the transect number. The third section indicates the sample location number along the transect. In some cases, the third section contains the letters FD, which indicate a field duplicate.

TABLE 13
ANALYTICAL CHEMISTRY RESULTS
MFLBC Phase III - TOC & Percent Fines
Nease Site, Salem, Ohio

Matrix: Floodplain Soil

	Sample Point SS95-26A-02FD Lab ID: L9165-19 Date Sampled: 9/11/95	Sample Point SS95-26A-03 Lab ID: L9165-24 Date Sampled: 9/11/95	Sample Point SS95-26B-01 Lab ID: L9165-20 Date Sampled: 9/11/95	Sample Point SS95-26B-02 Lab ID: L9165-21 Date Sampled: 9/11/95	Sample Point SS95-26B-03 Lab ID: L9165-22 Date Sampled: 9/11/95
Parameter	Result	Result	Result	Result	Result
Total Organic Carbon	8300 mg/Kg	3400 mg/Kg	10700 mg/Kg	7700 mg/Kg	4700 mg/Kg.
Percent Fines	94.3 %	56.5 %	63.5 %	91.9 %	77.6 %

Notes:

Percent Fines is the percentage of silt and clay sized particles contained in the sample. Grain size analysis results are reported in the Description of Soils table.

Sample points are identified by unique sets of characters. Each character set is divided into three sections. The first section indicates the medium - sediment (SD), floodplain soil (SS), or Rinsate Blank (RB), and the year sampled (95). The second section indicates the transect number. The third section indicates the sample location number along the transect. In some cases, the third section contains the letters FD, which indicate a field duplicate.

TABLE 13

ANALYTICAL CHEMISTRY RESULTS

MFLBC Phase III - TOC & Percent Fines

Nease Site, Salem, Ohio

Matrix: Sediment

	Sample Point SD95-08A-01 Lab ID: L9189-6 Date Sampled: 9/13/95	Sample Point SD95-08B-01 Lab ID: L9189-1 Date Sampled: 9/13/95	Sample Point SD95-08B-01FD Lab ID: L9189-10 Date Sampled: 9/13/95	Sample Point SD95-10-01 Lab ID: L9165-4 Date Sampled: 9/12/95	Sample Point SD95-12-01 Lab ID: L9165-13 Date Sampled: 9/11/95
Parameter	Result	Result	Result	Result	Result
Total Organic Carbon	900 mg/Kg	2000 mg/Kg	700 mg/Kg	700 mg/Kg	600 mg/Kg
Percent Fines	11.0 %	7.9 %	7.7 %	5.9 %	6.1 %

Notes:

Percent Fines is the percentage of silt and clay sized particles contained in the sample. Grain size analysis results are reported in the Description of Soils table.

Sample points are identified by unique sets of characters. Each character set is divided into three sections. The first section indicates the medium - sediment (SD), floodplain soil (SS), or Rinsate Blank (RB), and the year sampled (95). The second section indicates the transect number. The third section indicates the sample location number along the transect. In some cases, the third section contains the letters FD, which indicate a field duplicate.

ANALYTICAL CHEMISTRY RESULTS
MFLBC Phase III - TOC & Percent Fines
Nease Site, Salem, Ohio

Matrix: Sediment

	Sample Point SD95-12-01FD Lab ID: L9165-17 Date Sampled: 9/11/95	Sample Point Lab ID: Date Sampled:	Sample Point Lab ID: Date Sampled:	Sample Point Lab ID: Date Sampled:	Sample Point Lab ID: Date Sampled:
Parameter	Result	Result	Result	Result	Result
Total Organic Carbon	300 mg/Kg				
Percent Fines	7.5 %				

Notes:

Percent Fines is the percentage of silt and clay sized particles contained in the sample. Grain size analysis results are reported in the Description of Soils table.

Sample points are identified by unique sets of characters. Each character set is divided into three sections. The first section indicates the medium - sediment (SD), floodplain soil (SS), or Rinsate Blank (RB), and the year sampled (95). The second section indicates the transect number. The third section indicates the sample location number along the transect. In some cases, the third section contains the letters FD, which indicate a field duplicate.

TABLE 14
PHYSICAL DESCRIPTIONS OF FLOODPLAIN SOILS AND SEDIMENTS
MFLBC PHASE III
NEASE SITE, SALEM, OHIO

RNC Sample ID	Lab. Sample ID	Description of Sample	Percent Gravel	Percent Sand	Percent Silt- and Clay-Sized Particles	Percent Silt-Sized Particles	Percent Clay-Sized Particles
SD95-08A-01	L9189-6.3	gray poorly graded sand with silt	3.6	85.4	11.0	9.1	1.9
SD95-08B-01	L9189-1.3	light brown poorly graded sand with silt & gravel	20.6	71.4	7.9	6.5	1.5
SD95-08B-01FD	L9189-10.3	medium brown poorly graded sand with silt & gravel	27.1	65.3	7.7	6.0	1.6
SD95-10-01	L9165-4.4	gray poorly graded sand with silt	9.1	85.0	5.9	4.8	1.1
SD95-12-01	L9165-13.1	medium brown poorly graded sand with silt	0.4	93.5	6.1	5.3	0.8
SD95-12-01FD	L9165-17.2	light brown poorly graded sand with silt	0.7	91.8	7.5	6.0	1.5
SS95-08A-01	L9189-5.1	dark brown clayey silt	0.0	11.8	88.2	67.6	20.6
SS95-08A-02	L9189-7.3	medium brown sandy silt	0.0	20.5	79.5	66.6	12.9
SS95-08A-03	L9189-8.2	light brown sandy silt	0.0	35.0	65.0	55.6	9.4
SS95-08B-01	L9189-2.3	medium brown silty sand	0.1	59.6	40.3	33.2	7.1
SS95-08B-02	L9189-3.4	medium brown clayey silt with sand	0.0	18.6	81.4	65.8	15.6
SS95-08B-03	L9189-4.2	medium brown silt	0.0	9.3	90.7	78.2	12.5
SS95-10-01	L9165-6.2	medium brown silt with sand	0.0	18.1	81.9	70.3	11.6
SS95-10-02	L9165-7.1	dark brown silty sand	0.0	61.3	38.7	29.3	9.4
SS95-10-02FD	L9165-23.3	dark brown silty sand	0.0	59.8	40.2	31.9	8.3
SS95-10-03	L9165-8.2	medium brown silt	0.0	12.8	87.2	70.8	16.4
SS95-11-01	L9165-1.4	dark brown sandy silt	0.0	34.4	65.6	56.2	9.4
SS95-11-02	L9165-2.1	dark brown sandy silt	0.0	33.8	66.2	56.0	10.2
SS95-11-03	L9165-3.2	light brown sandy silt	5.3	38.8	55.9	50.4	5.5
SS95-12-01	L9165-11.4	medium brown silt with sand	0.2	47.7	52.1	41.8	10.3
SS95-12-02	L9165-12.4	medium brown sandy silt	0.2	41.7	58.1	49.6	8.5
SS95-12-03	L9165-14.3	medium brown poorly graded sand with silt	0.4	87.8	11.8	8.5	3.3
SS95-12-04	L9165-15.1	medium brown silty sand	5.8	46.9	47.3	36.3	11.0
SS95-14-01	L9121-13.1	medium brown silt with sand	0.0	16.3	83.7	73.4	10.3
SS95-14-01FD	L9121-14.2	medium brown silt with sand	0.1	17.8	82.2	72.0	10.1
SS95-14-02	L9121-12.3	dark brown sandy silt	0.0	30.4	69.6	60.7	8.9
SS95-14-03	L9121-11.2	medium brown silt	0.1	9.1	90.8	79.8	11.0
SS95-23-01	L9124-6.3	dark brown silt with sand	3.0	16.1	80.9	66.7	14.2
SS95-23-02	L9124-7.2	dark brown silt	0.0	8.6	91.4	71.5	19.9
SS95-23-03	L9124-4.3	medium brown sandy silt	7.1	28.2	64.8	51.5	13.2
SS95-23-04	L9124-5.3	medium brown silt with sand	4.1	15.5	80.4	66.1	14.3
SS95-24-01	L9124-1.2	medium brown silt with sand	0.0	17.1	82.9	69.6	13.3
SS95-24-02	L9124-2.2	medium brown silty sand	0.0	60.6	39.4	29.7	9.7

TABLE 14
PHYSICAL DESCRIPTIONS OF FLOODPLAIN SOILS AND SEDIMENTS
MFLBC PHASE III
NEASE SITE, SALEM, OHIO

RNC Sample ID	Lab. Sample ID	Description of Sample	Percent Gravel	Percent Sand	Percent Silt- and Clay-Sized Particles	Percent Silt-Sized Particles	Percent Clay-Sized Particles
SS95-24-03	L9124-3.1	dark brown silt	0.0	12.3	87.7	70.1	17.6
SS95-26A-01	L9165-9.2	medium brown silt with sand	1.8	17.0	81.2	59.9	21.3
SS95-26A-02	L9165-10.2	medium brown silt	0.0	6.7	93.3	70.4	22.9
SS95-26A-02FD	L9165-19.3	medium brown clayey silt	0.0	5.7	94.3	68.8	25.5
SS95-26A-03	L9165-24.2	medium brown sandy silt	11.6	31.9	56.5	47.4	9.1
SS95-26B-01	L9165-20.1	light brown sandy silt	14.5	21.9	63.5	51.0	12.6
SS95-26B-02	L9165-21.2	dark brown clayey silt	0.0	8.1	91.9	74.4	17.5
SS95-26B-03	L9165-22.2	medium brown sandy silt	0.0	22.4	77.6	66.2	11.4

TABLE 15
DESCRIPTION OF HABITATS OBSERVED IN THE VICINITY OF SAMPLE LOCATIONS MFLBC PHASE III

SAMPLE LOCATION	DESCRIPTION
SD95-M-1	This sample point was located in the MFLBC, approximately 150 feet downstream (north) from a 5-foot diameter culvert that passes under Pennsylvania Avenue. At this sample location, a sediment sample was collected 10 feet downstream from a riffle for metals analysis only. In this section of the MFLBC, the creek spans 5 to 6 feet in width and up to 1 and 1/2 feet in depth as it meanders between ten feet high slopes that lead to surrounding uplands. Several crayfish and minnows, along with a caddisfly larva, were observed in the creek in the vicinity of the sampling point. Trash and building debris also was observed in the creek and along its banks. The creek banks rise 2 to 3 feet above the water surface and lead to a narrow floodplain densely vegetated with wetland grasses and forbs. None of the slopes, dense stands of Japanese knotweed (an introduced noxious weed) have become established in several places. Several willow trees growing on the slopes provide less than 10 percent shade cover for the creek. On the western upland, an area of light industrial land use extends to within 50 to 100 feet of the creek corridor. Rubble and anthropogenic fill was observed where the industrial facility borders the creek corridor. On the eastern upland, an abandoned field extends to the east from the creek corridor.
SD95-M-2	This sample point was located in the MFLBC,250 feet southeast of State Highway Route 45 (Route 45). At this sample location, a primary and a field duplicate sediment sample were collected approximately 2 feet downstream (northwest) from a small, 2- to 4-foot-wide island along the western bank of the creek for metals analysis only. This section of the creek, situated within a large emergent/scrub/shrub wetland, is 15 feet wide and 1 1/2 to 3 feet deep. Numerous fish greater than 3 inches in length were observed in the vicinity of the sample location. Three-foot banks bound the creek and lead to broad floodplains vegetated with grasses and several herbaceous species, as well as willow and maple trees. Vegetation adjacent to the creek provides less than ten percent shade. About 10 feet downstream of the sample location, a small feeder stream enters the creek, and 15 feet downstream from the sample location an old beaver dam has promoted the formation of a large ponded area on the slow-moving, meandering creek. During sample point selection and collection, a slight sheen was observed on the water surface. Sheets of plywood were observed on the creek bottom in the vicinity of the sample location. Along the southwest side of the creek, in the vicinity of the small feeder stream, large piles of soil have been placed in the wetlands. Several additional piles located about 300 feet to the west appear to be staged for later placement in the wetlands. A light industrial facility on the western floodplain extends to within 300 feet of the creek. At some time in the past a large amount of rubble and anthropogenic fill had been dumped in the area where the industrial facility abuts the flooplain. The densely vegetated eastern floodplain supports facultative wetland species including red maple and willow tree saplings.

TABLE 15
DESCRIPTION OF HABITATS OBSERVED IN THE VICINITY OF SAMPLE LOCATIONS MFLBC PHASE III

SD95-M-3	This sample point was located in the MFLBC about 430 feet downstream (northwest) from Route 45. At this sample location, a sediment sample was collected near the northeastern bank of the creek for metals analysis only. This calm and slow-moving section of the creek is 8 to 10 feet wide and 6 to 12 inches deep. Young willow trees and reed canary grass line the 2-foot banks and provide approximately 10 percent shade cover. Gradually sloping floodplains exist on both sides of the creek. The northeastern floodplain is a broad wetland densely vegetated with grasses and trees. To the southwest, beyond a 5-foot buffer zone of herbaceous vegetation along the creek bank, the floodplain is maintained as a grass field. A small sewerage pumping station is located 50 feet southwest of the creek. The reed canary grass growing in the area may have become established as a result of restoration activities associated with installation of the pumping station. Plastic bottles and miscellaneous urban trash were observed in the creek upstream from the sample point. Approximately 15 feet upstream from the sample point, a large riveted tank railcar (determined by the cutoff access opening along one side) that is open at both ends sits parallel to the creek banks in the middle of the creek.
SD95-M-4	This sample point was located in an intermittent tributary that drains the forested eastern floodplain of the MFLBC. The sediment sample was collected approximately 200 feet upstream of the tributary's confluence with MFLBC, which is upstream from the Salem Wastewater Treatment Plant. The sediment sample was collected for metals analysis only. The tributary channel is 2 to 4 feet wide. The channel was dry at the time of sampling, but many crayfish holes lined the banks in the vicinity of the sample point. The eroded banks of the tributary slope to a height of 4 feet above the channel and merge with a forested upland that provides 80 to 90 percent shade cover. The intermittent drainageway barely meets the definition of a wetland and no wetlands were observed along either bank of the drainageway from the sample location all the way downstream to the drainageway confluence with MFLBC.

TABLE 15
DESCRIPTION OF HABITATS OBSERVED IN THE VICINITY OF SAMPLE LOCATIONS MFLBC PHASE III

SD95-M-5

This sample point was located in the Golf Course Tributary, which joins the MFLBC downstream from the Salem Wastewater Treatment Plant. approximately 430 feet east of Allen Road. A sediment sample was collected approximately 50 feet upstream (southeast) of the railroad tracks for metals analysis only.

The tributary is 8 to 10 feet wide and 2 to 3 feet deep in this area. The 15- to 20-foot-high banks rise steeply and lead to broad, flat sparsely vegetated uplands. Trees (including several dead box elders and willows) along with other herbaceous vegetation, cover the banks and provide 20 to 40 percent shade cover. An inactive beaver dam located 15 feet downstream from the sample point has stagnated the flow of water near the sample location. Partially buried, rusted drums were observed on the downstream side of the dam. Casting sand had been dumped along the western bank and extended as much as ten feet down the bank. Concrete debris also was observed on the bank slopes.

An office building is located on the eastern upland beyond a 50-foot wide field of mown grass. The western upland area is composed of fill material, and casting sand covers most of the western upland surface. The vegetation is composed of sparse patches of grass and other infrequent stands of woody vegetation, including a number of dead trees.

SD95-M-6

This sample point was located in the MFLBC, downstream (northwest) from the Salem Wastewater Treatment Plant (SWWTP) and approximately 250 feet upstream (southeast) of the MFLBC's confluence with the Golf Course Tributary. At this sample location, a sediment sample was collected for metals analysis only.

This section of the creek is 8 to 10 feet wide and 4 to 6 inches deep. The creek meanders through a 15- to 20-foot wide corridor surrounded by steep 3- to 4- foot high banks. The uninundated sediment bars on the corridor floor are vegetated with herbaceous plants. Several fallen trees span the creekbed both upstream and downstream of the sample location. No wetlands were observed beyond the banks of the creek. Trees growing along the banks provide approximately 50 percent shade cover. To the southwest, beyond a wooded area about 50 feet wide, a field extends to the edge of the SWWTP; a rifle range has been established in a portion of the field. To the northeast a broad forested floodplain extends northeast for more than 200 feet.

TABLE 15
DESCRIPTION OF HABITATS OBSERVED IN THE VICINITY OF SAMPLE LOCATIONS MFLBC PHASE III

SD95-M-7

This sample point was located in the MFLBC approximately 150 feet downstream from MFLBC's confluence with the Golf Course Tributary. At this sample location, a sediment sample was collected for metals analysis only.

This slow-moving section of the creek is 10 feet wide and 4 to 6 inches deep. The creekbed is 20 feet wide and surrounded by banks that rise 2 to 3 feet above the water surface. Trees along the banks provide 40 to 60 percent shade cover. No wetlands were observed beyond the banks. A broad, flat, forested floodplain stretches to the east and a 40- to 50-foot high forested landfill borders to the west. With trash evident on the surface, the landfill is apparently uncapped.

SD95-M-8

This sample point was located in the MFLBC approximately 300 feet upstream (southeast) from the culverts that pass under Allen Road. A sediment sample was collected for metals analysis only.

This section of the creek is 10 to 15 feet wide and 6 to 8 inches deep. A frog was seen near the sample location but was unidentifiable due to lack of daylight. Fish were observed on the upstream side of the three culverts that pass under Allen Road. The creek flows slowly between steep 4- to 5-foot high banks that lead to forested floodplains. Trees adjacent to the creek provide approximately 80 percent shade cover. The floodplains apparently flood infrequently and support a mixture of facultative wetland and facultative upland groundcover and tree species. Most of the trees appeared to be less than 40 years old. To the northeast, the forested floodplain extends about 200 feet before merging with abandoned agricultural field. To the southwest, the forested floodplain extends for more than 200 feet.

Numerous small ditches in the eastern floodplain run perpendicular to the creek and direct flow from agricultural fields into the creek. Also in this area, a number of soil piles were observed adjacent to the creek. Based on the sheerness of the creek's banks and the apparent lack of erosion in the area (based on the presence of trees rooted in the creek banks), the soil piles on the eastern floodplain may be indicative of historical dredging activities.

TABLE 15
DESCRIPTION OF HABITATS OBSERVED IN THE VICINITY OF SAMPLE LOCATIONS MFLBC PHASE III

SD95-M-9

This sample point was located in the MFLBC, west of the intersection of Allen Road and Beechwood Road, and approximately 30 feet downstream (north) from a private driveway bridge. A sediment sample was collected for metals analysis only.

The creek is approximately 10 feet wide and 6 to 12 inches deep in this section. Herbaceous vegetation grows in the uninundated portions of sediment bars that have developed parallel to flow within the channel. Steep banks, supported by 5-foot high concrete retaining walls in the vicinity of the bridge, are about 8 feet high and lead to broad, flat floodplains vegetated with herbaceous plants and some trees. Although the banks are eroded, flooding above the banks appears to occur infrequently. No trees are present to shade the creek in the vicinity of the sample location. Eight- to 10-foot high stands of Japanese knotweed cover the top of the western bank and portions of the eastern bank throughout the section. About 15 feet downstream of the sample location, a portion of the concrete wall supporting the eastern bank has cracked and partially collapsed.

Transect SS95-08A and associated samples

This transect was located about 500 feet downstream (north) from Route 45, and about 300 feet west of Kent Road. Three floodplain soil samples and one sediment sample were collected along this transect for MPK, TOC, and GS analyses.

Meandering and slow-moving, this section of the MFLBC is 15 to 20 feet wide and 4 to 12 inches deep. Trees along the creek provide 70 to 80 percent shade cover. To the west the eroded bank rises steeply 2 to 3 feet above the water surface and supports dense stands of rice cut grass and other herbaceous species. A forested floodplain extends westward. To the east the eroded bank rises steeply 1 to 2 feet and leads to a 50-foot forested zone of scattered facultative vegetation; beyond this zone, an abandoned agricultural field extends eastward to Road. Based on the presence of piled drift debris and some scouring, the area appears to flood occasionally.

Sample SS95-08A-01 was collected from the forested floodplain on the western side of the creek. The soil, a dark brown clayey silt, was sampled for mirex, photomirex, and kepone (MPK), total organic carbon (TOC), and grain size (GS) analyses. Facultative upland tree and groundcover species dominated. The scoured appearance of the hillock above the sample location, along with the sparsity of groundcover and presence of debris, indicates frequent flooding in the area. Vegetation in the area was estimated to range from 1 to 20 years in age.

Sample SS95-08A-02, a medium brown sandy silt, was collected from the forested floodplain on the western side of the creek. Soil was sampled for MPK, TOC, and GS analyses. Facultative upland tree and groundcover species

TABLE 15
DESCRIPTION OF HABITATS OBSERVED IN THE VICINITY OF SAMPLE LOCATIONS MFLBC PHASE III

Transect SS95-08A and associated samples, continued

dominate. Overstory vegetation was estimated to be from 1 to 20 years old. Understory vegetation was estimated to be from 2 to 3 years old.

SD95-08A-01 was collected near the undercut western bank of the creek, approximately 20 feet downstream of a fallen log and 25 feet upstream of a gravel bar in the creek. Water was 6 inches deep. At this location, the sediment (a gray poorly graded sand with some silt) was sampled for MPK, TOC, and GS analyses. A separate sediment sample, SD95-M-10, was collected from the same vicinity for metals analysis.

Sample SS95-08A-03, a light brown sandy silt collected from the forested floodplain on the eastern side of the creek, was sampled for MPK, TOC, and GS analyses. Facultative herbaceous species covered 70 percent of the ground surface. Of the trees present in the vicinity of the sample location, box elder was the predominant species. One 4-inch (DBH) cherry and one 4-inch (DBH) elm also were observed.

Transect SS95-08B and associated samples

The transect was located 750 feet northwest of Kent Road and 500 feet west of Goshen Road. three floodplain soil samples and one sediment sample were collected along this transect for MPK, TOC, GS, and SVOC analyses. A field duplicate was collected at SD95-08B-01.

The channel in this section of the MFLBC is 15 to 20 feet wide and 2 to 15 inches deep. The tops of the slightly eroded creek banks rise approximately 3 feet above the water surface and are densely vegetated with grasses and other facultative herbaceous species. A number of trees, including a basswood and several elms, are present on the floodplain near the banks and increase in number further from the creek. To the northwest, a forested floodplain extends at least 200 feet before being interrupted by a cleared area, apparently a utility line right-of-way. The forested floodplain then continues to the northwest. To the southeast, a very narrow (10-foot wide) floodplain merges into a steep, 15-foot high forested slope.

Sample SS95-08B-01, a medium brown silty sand collected from a low-lying area on the northwestern floodplain was collected for MPK, TOC, GS and semivolatile (SVOC) analyses The area supports a dense community of facultative wetland herbaceous and shrub/scrub species such as wool grass, joepye-weed, cattails, burreed, arrowhead tearthumb, turtlehead, and silky dogwood. The sample location appeared to be on a cleared right-of-way for utility lines.

Sample SS95-08B-02, a medium brown clayey silt with some sand located in a forested area of the northwestern floodplain, was collected for MPK, TOC, GS and SVOC analyses. The area supports several facultative wetland

TABLE 15
DESCRIPTION OF HABITATS OBSERVED IN THE VICINITY OF SAMPLE LOCATIONS MFLBC PHASE III

Transect SS95-08B and associated samples, continued	herbaceous and tree species, such as sensitive fern, box elder, and willow. Several facultative upland plants, including raspberry species and black cherry trees also are present. Water-stained Stained leaves were observed throughout the area. The sediment sample SD95-08B-01, a light brown poorly graded sand with some silt, was collected from the creek near the northwestern bank, 15 feet downstream (northeast) from a fallen log and 20 feet upstream (southwest) from several other fallen trees and a gravel bar. A primary sediment sample and a field duplicate were collected for MPK, TOC, GS, and SVOC analyses. Sample SS95-08B-03, a medium brown silt, was collected from the narrow forested southeastern floodplain about 5 feet southeast of the creek, near the base of a 15-foot high, steeply-rising slope. Soil was collected for MPK, TOC, GS and SVOC analyses. Various species of herbaceous plants such as jewelweed, false nettle, and sneezeweed, as well as one beech tree, were observed growing on the floodplain. Numerous trees, including several cherry trees, recently had been cut down and left where they had fallen on the floodplain and along the slope.
Transect SS95-10 and associated samples	The transect of the MFLBC was located approximately 2,750 feet south of Middletown Road and 1,750 feet west of a cleared, grassed, natural gas pipeline right-of-way that runs perpendicular to Middletown Road. Three floodplain soil samples and one sediment sample were collected along this transect for MPK, TOC, GS, and SVOC analyses. A sediment sample was also collected for metals analysis. Also, at SS95-10-02, a field duplicate was collected. *This reach of the meandering, slow-moving creek* is 10 to 12 feet wide and 4 to 24 inches deep. From an area 30 feet upstream (southwest) to a bend in the creek, the northwestern bank slopes gradually to form a relatively flat, narrow (10- to 20-foot wide) floodplain, which is covered with dense herbaceous vegetation. the floodplain ends abruptly at the base of a sharply rising slope that extends for at least 15 vertical feet. The transect was located about 10 feet south of the flatter area. Further upstream and downstream of this flatter, more open area, the eroded northwestern bank rises 1 to 2 feet above the water and leads to a narrow forested floodplain and subsequent steep rise. On the southeastern side of the creek, the eroded bank rises 3 to 5 feet above the water and leads to a broad, forested floodplain. In the vicinity of the transect, the trees along the banks provide the creek with 10 to 20 percent shade cover; further upstream and downstream of the bend, the trees provide higher percentages of cover. A blue heron was observed leaving the area as samplers approached.

TABLE 15
DESCRIPTION OF HABITATS OBSERVED IN THE VICINITY OF SAMPLE LOCATIONS MFLBC PHASE III

Transect SS95-10 and associated samples, continued

Soil sample SS95-10-01, a medium brown silt with sand, was collected about 50 feet from the creek, on the narrow northwestern floodplain near the base of the steep rise. Soil was collected for MPK, TOC, GS, and SVOC analyses. Several large elm trees on the floodplain and numerous other trees of various ages on the upgradient slope provide 90 percent shade cover. Several facultative herbaceous species are growing sparsely on the forest floor, which is covered with water-stained leaves.

The samples SD95-10-01, a gray poorly graded sand with silt (analyzed for MPK, TOC, GS, and SVOC analyses), and SD95-M-11 (analyzed for TAL metals analysis only) were collected 15 feet upstream from the bend in the creek, near the northwestern edge of the creek and the narrow floodplain covered with herbaceous vegetation.

SS95-10-02, a dark brown silty sand, was collected from the forested floodplain southeast of the creek and analyzed for MPK, TOC, GS, and SVOC analyses. A field duplicate also was collected. Red maples predominate the overstory. The understory is comprised of numerous species of tree saplings and several species of facultative and facultative upland herbaceous plants. Water-stained leaves and snagged organic debris on the forest floor indicate that flooding occurs occasionally in the area. A toad was observed near this sample location.

At SS95-10-03, a medium brown silt located east of the creek on the forested floodplain, was collected for MPK, TOC, GS, and SVOC analyses. The habitat is similar to that of SS95-10-02, although herbaceous vegetation was observed to be sparser at this greater distance from the creek.

Transect SS95-11

This transect crossed the MFLBC and surrounding forested floodplain approximately 1500 feet south of Middletown Road and 625 feet east of a gas pipeline right-of-way that ran perpendicular to Middletown Road. Three floodplain soil samples were collected along this transect for MPK, TOC, and GS analyses.

Along this reach the slow-moving creek is fairly straight, 15 to 20 feet wide, and 6 to 12 inches deep. Numerous cobbles, stones, and boulders were visible throughout the creekbed. To the east of the creek, the land slopes gradually for several feet then rises sharply to an elevation of 10 to 15 feet. The land is forested, and some tree roots along the slope have been exposed by erosion. To the west of the creek, the bank rises 2 to 3 feet above the water surface and levels off into a broad, forested floodplain.

At sample location SS95-11-01, a dark brown sandy silt located on the western floodplain, was collected for MPK,

TABLE 15
DESCRIPTION OF HABITATS OBSERVED IN THE VICINITY OF SAMPLE LOCATIONS MFLBC PHASE III

Transect SS95-11, continued	TOC, and GS analyses. Shagbark hickory, black cherry, and beech trees, along with several large red oak trees, provide 80 to 90 percent shade coverage. Numerous saplings also are present. Herbaceous species include lady fern, Solomon's Seal, and maple leaf viburnum. Water- and sediment-stained leaves observed on the forest floor, and several scoured flood channels observed near the sample location indicate that flooding occurs frequently in the area. Sample SS95-11-02, a dark brown sandy silt, was collected from the western floodplain for MPK, TOC, and GS analyses. Numerous large hickory, red maple, and ironwood trees provide 80 to 90 percent shade cover in the area of the sample location. Maple leaf viburnum and cherry saplings are scattered throughout the understory landscape. Water- and sediment-stained leaves and scoured flood channels were observed in the area, as well as snagged debris and exposed roots, all of which are indicative of flooding. Sample SS95-11-03, a light brown sandy silt, was located approximately 10 feet east of the edge of the creek, on the lower reach of the sloping bank. Soil samples were collected for MPK, TOC, and GS analyses. Elm and red maple trees growing on the flat and the slope provide seventy percent shade cover to the area. The sparse herbaceous vegetation in the area is composed mainly of tree seedlings. Tree roots visible on the scoured slope indicate the occurrence of severe erosion.
Transect SS95-12 and associated samples	This transect crossed the MFLBC behind a recreational vehicle dealership on the western side of State Route 45, and about 300 feet downstream (north) of a bridge for a private driveway. Four floodplain samples and one sediment sample were collected for MPK, TOC, GS, and SVOC analyses. A field duplicate was collected at SD95-12-01. The creek is 8 to 12 feet wide and 6 to 18 inches deep along this reach. The banks of the creek, which rise 3 to 4 feet above the water surface, are densely vegetated with grasses. Broad floodplains that extend to the east and west support dense herbaceous vegetation (mainly grasses) and scattered trees. Sample SS95-12-01, a medium brown silt with some sand, was located on the grassy western floodplain, where soil samples were collected for MPK, TOC, and GS analyses. Several large trees, including black willows, are growing in the area.

TABLE 15
DESCRIPTION OF HABITATS OBSERVED IN THE VICINITY OF SAMPLE LOCATIONS MFLBC PHASE III

Transect SS95-12 and associated samples	SS95-12-02, a medium brown sandy silt, was located approximately 10 feet from the western bank of the creek. Soil samples were collected for MPK, TOC, and GS analyses. Grasses, jewelweed, smartweed, sneezeweed, and other herbaceous plants cover the ground. Several large black willow trees and numerous saplings are growing in the vicinity of the sample point. Sediment sample SD95-12-01, a medium brown poorly graded sand with some silt, was located about 10 feet downstream of a riffle area. Sediment samples were collected for MPK, TOC, and GS analyses. A field duplicate was collected. At SS95-12-03, a medium brown poorly graded sand with some silt located on the eastern bank, on a small peninsula, was collected for MPK, TOC, and GS analyses. The peninsula, separated from the floodplain by a 1 to 1 1/2-foot wide ditch, is densely vegetated with grasses and several shrubs. Sample SS95-12-04, a medium brown silty sand, was located on the eastern floodplain, near the edge of a grassed, open area. Soil samples were collected for MPK, TOC, and GS. Sneezeweed and New York ironweed are scattered throughout the area, along with several black walnut trees and an apple tree. A groundhog hole was observed nearby the sample location.
Transect SS95-14 and associated samples	The transect crossed the MFLBC approximately 2,500 feet east of State Route 45. The creek is 10 to 15 feet wide and 6 to 12 inches deep, with 3- to 4-foot banks. Three floodplain soil samples were collected along this transect for MPK, TOC, and GS analyses. A field duplicate was collected. On the northern floodplain, a 100-foot swath of emergent wetland supports numerous willow trees and dense understory vegetation. Beyond the emergent wetland, a forested floodplain extends approximately 140 feet and supports trees such as American elm, alder, and black walnut. The floodplain then dips slightly to form a 30- to 40-foot wide wetland depression before rising to form a small hill, as forested floodplain merges with upland forest. On the southern floodplain the land gradually slopes upward and is covered with herbaceous vegetation. Approximately 90 feet from the bank, dense stands of raspberry species have become established. Further upslope, tree species including black cherry, black locust, and box elder comprise a 20- to 30-foot wide swath of forest that leads to a meadow. Sample SS95-14-01, a medium brown silt with some sand, was located on the northern bank of the creek, in the wetland depression that exists near the floodplain-upland boundary. Soil samples were collected for MPK, TOC, and

TABLE 15
DESCRIPTION OF HABITATS OBSERVED IN THE VICINITY OF SAMPLE LOCATIONS MFLBC PHASE III

Transect SS95-14 and associated samples, continued	GS analyses. A field duplicate was collected. Vegetation in the vicinity included turtleheads and other obligate wetland herbaceous species. Sample SS95-14-02, a dark brown sandy silt, was located on the edge of an emergent wetland area near the creek. Soil was collected for MPK, TOC, and GS analyses. The area supports facultative wetland herbaceous plants such as reed canary grass and three species of smartweed, as well as several willow trees. Sample SS95-14-03, a medium brown silt, was located on a densely vegetated marginal wetland, from which soil samples were collected for MPK, TOC, and GS analyses. The area is predominated by facultative wetland herbaceous species such as New York ironweed, tearthumb, jewelweed, reed canary grass, and willow herb. Several facultative upland herbaceous species, including thistle and teasel also were observed. Collapsed rodent burrows were observed near the sample location.
Transect SS95-24	The transect was located on the MFLBC approximately 50 feet southwest of the intersection of State Highway Alternate 14 and Lisbon Road. Three floodplain soil samples were collected along this transect for MPK, TOC, and GS analyses. The creek is 10 to 15 feet wide and at least 3 feet deep in this section. The northeastern creek bank rises 3 to 4 feet above the water surface and levels off to a narrow (5- to 10-foot wide) forested floodplain where several large willow trees and a silver maple tree were observed. The floodplain terminates at the base of the berm for Alternate Route 14, which rises 10 to 15 feet to the road surface. The berm is composed of fill material including concrete, tires, macadam, wood, and items that appear to be asbestos blocks, as well as soil. The southwestern creek bank, which rises 2 to 3 feet above the water surface, supports stands of Japanese knotweed that extend several feet onto the floodplain, along with numerous large willow trees. Beyond the Japanese knotweed, the floodplain becomes a broad, saturated, densely vegetated marsh predominated by broad- and narrow-leafed cattails, along with several stands of bulrushes and wool grass. Common reed and Japanese knotweed were observed growing along the northern margin of the marsh. Sample SS95-24-01, a medium brown silt with some sand, was located on the narrow forested northern floodplain of the creek. Soil was collected for MPK, TOC, and GS analyses. Little ground cover was observed in this area. Trash was scattered throughout this section of the floodplain.

TABLE 15
DESCRIPTION OF HABITATS OBSERVED IN THE VICINITY OF SAMPLE LOCATIONS MFLBC PHASE III

Transect SS95-24, continued

SS95-24-02, a medium brown silty sand with some clay, was collected from the southern floodplain, in the cattail marsh, and analyzed for MPK, TOC, and GS. A number of silky dogwood and buttonbush shrubs were observed in the vicinity of a dead tree that stands near the sample point.

SS95-24-03, a dark brown silt, was collected from a region of the marsh dominated by narrow-leafed cattails, and at the edge of what apparently is a depression that contains ponded water under normal (non-drought) conditions. Soil was sampled for MPK, TOC, and GS analyses. A translucent, white salt crust was observed along the edge of what would be the ponded area.

Transect SS95-26A

The transect was located on the MFLBC approximately 1,000 feet downstream (south) of the confluence of an unnamed tributary that drains the eastern floodplain of the MFLBC with the MFLBC itself (about 1,500 feet upstream (north) of Butcher Road bridge), and about 400 feet west of Lisbon Road. Three floodplain soil samples were collected along this transect for MPK, TOC, and GS analyses. A field duplicate was collected at SS95-26A-02.

The creek is 10 feet to 15 feet wide and at least 3 feet deep in this section of the creek. The banks rise 3 to 4 feet above the water surface and are overgrown with dense stands of Japanese knotweed. The eastern bank leads to a gradual, upward-sloping forested/scrub-shrub floodplain that extends to Lisbon Road. The western bank leads to a narrow (15 to 20 foot-wide) floodplain covered with Japanese knotweed that abruptly slopes upward to elevations of 15 to 20 feet above the water surface of the creek. The slope, which supports scrub-shrub vegetation may have been built up during sand mining activities that once occurred on the floodplain and upland west of the creek. According to a local resident, mining activities have been abandoned for several years, as evidenced by the growth of vegetation in the area.

Sample SS95-26A-01, a medium brown silt with some sand, was collected from the eastern floodplain of the creek for MPK, TOC, and GS analyses. A dense stand of Japanese knotweed covers the bank; goldenrod, poison ivy, and tree saplings are among the scrub-shrub vegetation that covers the slopes of the floodplain.

Sample SS95-26A-02, a medium brown silt with some clay, was located on the eastern floodplain of the creek, where soil samples were collected for MPK, TOC, and GS analyses. A field duplicate was collected. The ground surface beneath a dense stand of Japanese knotweed and tree saplings surface was sparsely vegetated. Water-stained leaves observed in the vicinity of the sample location indicate occasional flooding.

Sample SS95-26A-03, a medium brown sandy silt, was collected west of the creek on the upward-sloping floodplain

TABLE 15
DESCRIPTION OF HABITATS OBSERVED IN THE VICINITY OF SAMPLE LOCATIONS MFLBC PHASE III

Transect SS95-26A, continued	for MPK, TOC, and GS analyses. Beyond the dense stand of Japanese knotweed, grasses, goldenrods, poison ivy, several raspberry species, and tree saplings cover the narrow floodplain and adjacent hillside.
Transect SS95-26B	The transect was located approximately 3,000 feet downstream of the point where Butcher Road bridge crosses the MFLBC. Three floodplain soil samples were collected along this transect for MPK, TOC, and GS analyses. The creek in this section is 6 to 10 feet wide, and 2 to 4 feet deep; the banks rise 2 to 5 feet above the water surface. The western creek bank leads to a slightly elevated stretch of land about 20 feet wide, which supports dense stands of Japanese knotweed that are at least 10 feet wide. Beyond this drier leveed area, a marsh extends to the west about 225 feet before the land slopes upward and becomes a forested upland. The eastern creek bank upstream of the transect supports dense stands of Japanese knotweed, beyond which the floodplain slopes to forested upland. In contrast, about 50 feet upstream and 50 feet downstream from sample location SS95-26B-03, the eastern creek bank is free of Japanese knotweed. The bank leads to a narrow (20- to 50-foot wide) floodplain, which slopes to upland. Supporting pasture grasses and several small stands of trees both floodplain and hillside serve as pasture land.
Sample SS95-26B-01	Sample SS95-26B-01 a light brown sandy silt, was collected from the western floodplain of the creek, near the margin of a cattail marsh and the base of the forested upland slope. Soil was collected for MPK, TOC, and GS analyses. Numerous tree saplings, including box elders and elms, comprised the vegetation on the upland slope, while smartweed, alder, and cattails vegetated the ground surface surrounding the sample location. Standing water was observed less than 10 feet to the east of the sample.
Sample SS95-26B-02	Sample SS95-26B-02, a dark brown clayey silt, was collected from the western floodplain of the creek, about 5 feet west of the dense stands of Japanese knotweed that covered the stretch of land adjacent to the marsh. Soil was collected for MPK, TOC, and GS analyses. A large willow tree is growing about 10 feet to the south of the sample location. Several grass species partially cover the ground surface near the sample location. The unvegetated areas may be indicative of frequent flooding. A large number of frogs inhabit the ponded area directly west of the sample location.

TABLE 15
DESCRIPTION OF HABITATS OBSERVED IN THE VICINITY OF SAMPLE LOCATIONS MFLBC PHASE III

Sample SS95-26B-03	Sample SS95-26B-03, a medium brown sandy silt located on the eastern bank of the creek, in the center of the narrow floodplain was collected for MPK, TOC, and GS analyses. The floodplain is dominated by pasture grasses, with several species of smartweed scattered throughout. The overstory is dominated by a very large willow tree (3 feet DBH), located about 5 feet from the sample location. To the east on the slope, several more willows and other tree species shade the floodplain.

TABLE 16
Results of 1991 Remedial Investigation
Sediment and Floodplain Soil Sampling Program: Egypt Swamp

Sample Number	Sediment	Floodplain Soil	Mirex	Photomirex	Kepone
SD91-19A	✓		ND	ND	ND
SD91-20	✓		403	ND	ND
SD91-18	✓		57.5	ND	ND
SD91-19	✓		125	ND	ND
SD91-19B	✓		93.7	ND	ND
SD91-21	✓		45.5	0.479	ND
SD91-22	✓		175	ND	ND
SD91-23	✓		107	2.96	ND
SS-19A-01		✓	ND	ND	ND
SS-19A-02		✓	ND	ND	ND
SS-19A-03		✓	ND	ND	ND
SS-19A-04		✓	25.4	ND	ND
SS-19B-01		✓	52	ND	ND
SS-19B-02		✓	23.9	ND	ND
SS-19B-03		✓	ND	ND	ND
SS-19B-04		✓	ND	ND	ND

a All concentrations are in μg/kg;
ND Not Detected

TABLE 17
Results of 1993 Egypt Swamp Soil/Sediment Sampling Program: Mirex, Photomirex, and Kepone

Sample Number	Floodplain Soil	Sediment	Mirex	Photomirex	Kepone
SS93-01	✓		10.4[a,J]	ND[b]	ND
SS93-2A\2B	✓		315	ND	ND
SS93-03	✓		4.4[J]	ND	ND
SS93-04A/04B	✓		124	2.5[J]	ND
SS93-05	✓		37.5	ND	ND
SS93-06A/06B	✓		413	4.5[J]	ND
SS93-07	✓		2.9[J]	ND	ND
SS93-8A/8B	✓		4080	49.1	56.3[J]
SS93-09	✓		14.1[J]	ND	ND
SS93-10A/10B	✓		16.8[J]	ND	ND
SS93-11A/11B	✓		119	1.4[J]	ND
SS93-12A/12B	✓		71.9	1.0[J]	ND
SS93-13B		✓[d]	3.7[J]	ND	ND
SS93-014	✓		35.5	ND	ND
SS93-015	✓		514	5.0[J]	2.3[J]
SS93-16A/16B	✓		18.7	0.3[J]	ND
SS93-17A/17B	✓		293	5.3[J]	7.0[J]

[a] All concentrations are in μg/kg
[J] Concentration is below quantitation limits and is an estimate only; quantitation limits are 18.5 μg/kg mirex, 20.4 photomirex, and 68.0 kepone
[c] Not detected
[d] Sediment sample from wetland pond, not an MFLBC in-stream sediment sample

TABLE 18 Results of 1993 Egypt Swamp Soil/Sediment Sampling Program: Total Organic Carbon	
Sample Identification	**Total Organic Carbon (%)**
SS93-01	8.0
SS93-2A\2B	3.6
SS93-03	10.8
SS93-04A/04B	5.2
SS93-05	4.9
SS93-06A/06B	8.4
SS93-07	12.9
SS93-8A/8B	5.3
SS93-09	7.6
SS93-10A/10B	19.6
SS93-11A/11B	7.2
SS93-12A/12B	49.2
SS93-13B	3.7
SS93-014	16.7
SS93-015	8.9
SS93-16A/16B	12.3
SS93-17A/17B	4.0

TES

ORDINATE SYSTEM IS OHIO STATE PLANE (NAD27).

ITS ARE MICROGRAMS PER KILOGRAM (ug/kg).

LONIAL VILLA SAMPLES (CV-1 THROUGH CV-15) WERE COLLECTED AND ALYZED IN AUGUST 1991.

FOR STUDY STRETCH DATA TABLES SEE ATTACHMENT N2.

ERENCES

BITAT TYPES AND EXTENTS, HABITAT SAMPLE POINTS, STREAM SURVEY POINTS, FLE/RUN AREA AND SEDIMENT BODY INFORMATION FROM EASTERN STATES VIRONMENTAL ASSOCIATES, INC. REPORT TITLED "ECOLOGICAL HABITAT INVENTORY D STREAM SURVEY REPORT." SEE ATTACHMENT N2.

SE MAP FROM 1991 AERIAL SURVEY FOR ERM-MIDWEST, INC.

MAY 24 1996

DATE	DESCRIPTION	DR BY	CHK BY	RVW BY

CT:

RNC

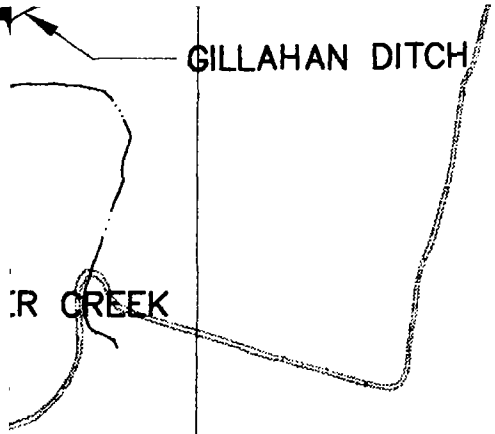
RUETGERS-NEASE CORPORATION
MIDDLE FORK OF LITTLE BEAVER CREEK
SALEM, OHIO

CHEMISTRY AND ECOLOGICAL INFORMATION MIDDLE FORK OF LITTLE BEAVER CREEK (Sheet 1 of 9)

Golder Associates
Mt. Laurel, New Jersey

PROJECT No.	933-6154		FILE No.:	OH01-496
CLIENT PROJ. No.			DRAFTING SUBTITLE:	13
DES BY	EAD	04/15/96	SCALE:	AS SHOWN
DR BY	JSG	05/19/96		
CHK BY	EAD	[illegible]		
RVW BY	[illegible]	[illegible]		

FIGURE 2



SS95-14-02	350		58.0	
SS95-14-03	25.7		ND	

500 0 500 1000
scale feet

MAY 24 1995

REV	DATE	DESCRIPTION	DR BY	CHK BY	RVW BY

PROJECT:

RNC

RUETGERS-NEASE CORPORATION
MIDDLE FORK OF LITTLE BEAVER CREEK
SALEM, OHIO

CHEMISTRY AND ECOLOGICAL INFORMATION MIDDLE FORK OF LITTLE BEAVER CREEK (Sheet 2 of 9)

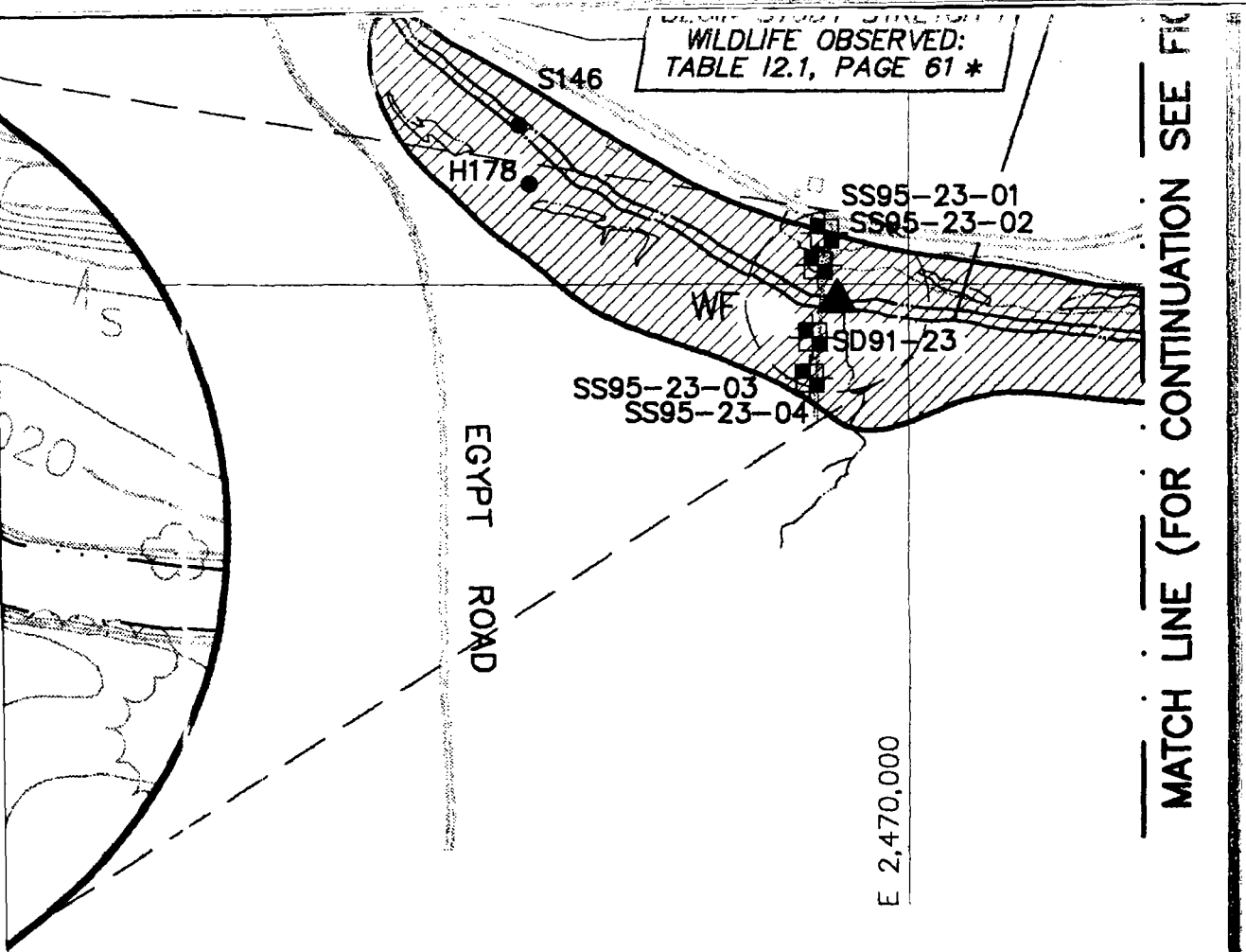
E 2,465,000

Golder Associates
Mt. Laurel, New Jersey

PROJECT No.	933-6154	
CLIENT PROJ. No.		
DES BY	EAD	04/10/96
DR BY	JSG	05/19/96
CHK BY	EAI	05/23/96
RVW BY		

FILE No.:	OH01-497
DRAFTING SUBTITLE:	13
SCALE:	AS SHOWN

FIGURE 3



500 0 500 1000

scale feet

MAY 24 199[illegible]

DATE	DESCRIPTION	DR BY	CHK BY	RVW BY

T:

RNC

RUETGERS-NEASE CORPORATION
MIDDLE FORK OF LITTLE BEAVER CREEK
SALEM, OHIO

CHEMISTRY AND ECOLOGICAL INFORMATION MIDDLE FORK OF LITTLE BEAVER CREEK (Sheet 3 of 9)

Golder Associates
Mt. Laurel, New Jersey

PROJECT No.	933-6154		FILE No.:	OH01-498
CLIENT PROJ. No.			DRAFTING SUBTITLE:	13
DES BY	EAD	04/16/96	SCALE:	AS SHOWN
DR BY	JSG	05/19/96		
CHK BY	EAT	05/21/96		
RVW BY	[illegible]	[illegible]		

FIGURE 4

AGRICULTURE / PASTURE

DEVELOPED AREA

S

DINATE SYSTEM IS OHIO STATE PLANE (NAD27).

ARE MICROGRAMS PER KILOGRAM (ug/kg).

R STUDY STRETCH DATA TABLES SEE ATTACHMENT N2.

RENCES

AT TYPES AND EXTENTS, HABITAT SAMPLE POINTS, STREAM SURVEY POINTS, E/RUN AREA AND SEDIMENT BODY INFORMATION FROM EASTERN STATES ONMENTAL ASSOCIATES, INC. REPORT TITLED "ECOLOGICAL HABITAT INVENTORY STREAM SURVEY REPORT." SEE ATTACHMENT N2.

MAP FROM 1991 AERIAL SURVEY FOR ERM-MIDWEST, INC.

500 0 500 1000

scale feet

MAY 24 1996

DATE	DESCRIPTION	DR BY	CHK BY	RVW BY

RNC

RUETGERS-NEASE CORPORATION
MIDDLE FORK OF LITTLE BEAVER CREEK
SALEM, OHIO

HEMISTRY AND ECOLOGICAL INFORMATION
MIDDLE FORK OF LITTLE BEAVER CREEK
(Sheet 4 of 9)

Golder Associates
Mt. Laurel, New Jersey

PROJECT No.	933-6154		FILE No.:	OH01-499
CLIENT PROJ. No.			DRAFTING SUBTITLE:	13
DES BY	EAD	04/15/96	SCALE:	AS SHOWN
DR BY	JSG	05/19/96		
CHK BY	EAD	[illegible]		
RVW BY	[illegible]	[illegible]		

FIGURE 5

COORDINATE SYSTEM IS OHIO STATE PLANE (NAD27).

CONTOURS ARE APPROXIMATE ONLY.

UNITS ARE MICROGRAMS PER KILOGRAMS (ug/kg).

* FOR STUDY STRETCH DATA TABLES SEE ATTACHMENT N2.

EFERENCES

HABITAT TYPES AND EXTENTS, HABITAT SAMPLE POINTS, STREAM SURVEY POINTS, RIFFLE/RUN AREA AND SEDIMENT BODY INFORMATION FROM EASTERN STATES ENVIRONMENTAL ASSOCIATES, INC. REPORT TITLED "ECOLOGICAL HABITAT INVENTORY AND STREAM SURVEY REPORT." SEE ATTACHMENT N2.

BASE MAP (EXCLUDING CONTOURS) TAKEN FROM WEST POINT AND EAST LIVERPOOL NORTH 7.5 MINUTE U.S.G.S. QUADRANGLE AUTOCAD FILES SUPPLIED BY AMERICAN DIGITAL CARTOGRAPHY, APPLETON WISCONSIN. DATA SHOWN CONTAINS DLG, GNIS AND USCB TIGER DATA.

CONTOURS SUPPLIED BY BLUE HIGHWAYS MAP COMPANY, CALEDONIA ILLINOIS. CONTOURS CREATED WITH QUICKSURF SOFTWARE USING U.S.G.S. 1:250,000 QUADRANGLES (DIGITAL ELEVATION MODEL) AND THREE ARC SECOND GRID. CONTOURS ARE NOT TO BE USED FOR ELEVATION AND/OR SLOPE MEASUREMENTS.

500 0 500 1000

scale feet

MAY 2 4 1996

DATE	DESCRIPTION	DR BY	CHK BY	RVW BY

RNC

RUETGERS-NEASE CORPORATION
MIDDLE FORK OF LITTLE BEAVER CREEK
SALEM, OHIO

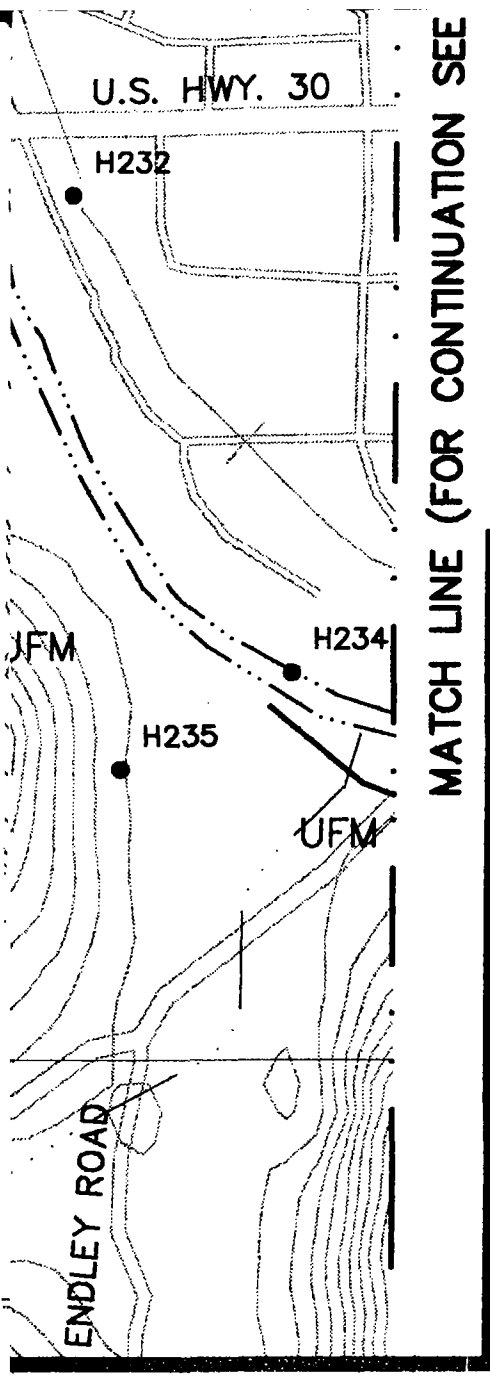
CHEMISTRY AND ECOLOGICAL INFORMATION MIDDLE FORK OF LITTLE BEAVER CREEK

(Sheet 5 of 9)

Golder Associates
Mt. Laurel, New Jersey

PROJECT No.	933-6154		FILE No.:	OH01-491
CLIENT PROJ. No.			DRAFTING SUBTITLE:	13
DES BY	EAD	04/11/96	SCALE:	AS SHOWN
DR BY	JSG	05/19/96		
CHK BY				
RVW BY				

FIGURE 6



ENVIRONMENTAL ASSOCIATES, INC. REPORT TITLED "ECOLOGICAL HABITAT INVENTORY AND STREAM SURVEY REPORT." SEE ATTACHMENT N2.

2.) BASE MAP (EXCLUDING CONTOURS) TAKEN FROM WEST POINT AND EAST LIVERPOOL NORTH 7.5 MINUTE U.S.G.S. QUADRANGLE AUTOCAD FILES SUPPLIED BY AMERICAN DIGITAL CARTOGRAPHY, APPLETON WISCONSIN. DATA SHOWN CONTAINS DLG, GNIS AND USCB TIGER DATA.

3.) CONTOURS SUPPLIED BY BLUE HIGHWAYS MAP COMPANY, CALEDONIA ILLINOIS. CONTOURS CREATED WITH QUICKSURF SOFTWARE USING U.S.G.S. 1:250,000 QUADRANGLES (DIGITAL ELEVATION MODEL) AND THREE ARC SECOND GRID. CONTOURS ARE NOT TO BE USED FOR ELEVATIONS AND/OR SLOPE MEASUREMENTS.

500 0 500 1000
scale feet

MAY 24 1996

REV	DATE	DESCRIPTION	DR BY	CHK BY	RVW BY

PROJECT:

RNC

RUETGERS-NEASE CORPORATION
MIDDLE FORK OF LITTLE BEAVER CREEK
SALEM, OHIO

CHEMISTRY AND ECOLOGICAL INFORMATION MIDDLE FORK OF LITTLE BEAVER CREEK

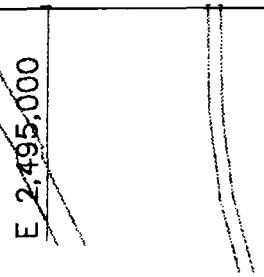
(Sheet 6 of 9)

Golder Associates
Mt. Laurel, New Jersey

PROJECT No.	933-6154	
CLIENT PROJ. No.		
DES BY	EAD	04/11/96
DR BY	JSG	05/19/96
CHK BY		
RVW BY		

FILE No.:	OH01-492
DRAFTING SUBTITLE:	13
SCALE:	AS SHOWN

FIGURE 7



500 0 500 1000

scale feet

MAY 24 1996

REV	DATE	DESCRIPTION	DR BY	CHK BY	RVW BY

PROJECT:

RNC

RUETGERS-NEASE CORPORATION
MIDDLE FORK OF LITTLE BEAVER CREEK
SALEM, OHIO

CHEMISTRY AND ECOLOGICAL INFORMATION MIDDLE FORK OF LITTLE BEAVER CREEK

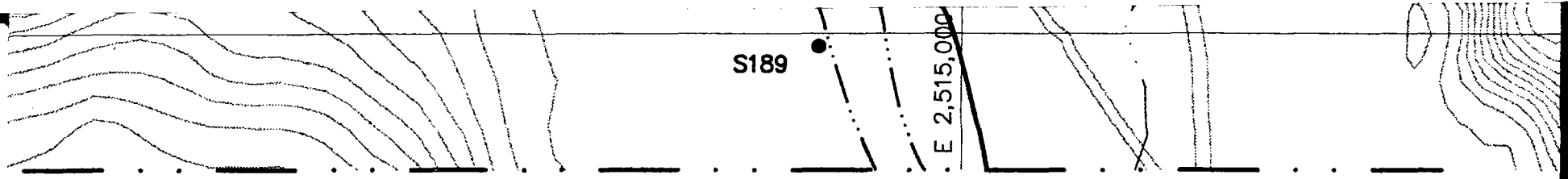
(Sheet 7 of 9)

Golder Associates
Mt. Laurel, New Jersey

PROJECT No.	933-6154	
CLIENT PROJ. No.		
DES BY	EAD	04/10/96
DR BY	JSG	05/20/96
CHK BY	EAD	05/23/96
RVW BY		

FILE No.:	OH01-493
DRAFTING SUBTITLE:	13
SCALE:	AS SHOWN

FIGURE 8



MATCH LINE (FOR CONTINUATION SEE FIGURE 9)

M SURVEY POINTS,
STERN STATES
HABITAT INVENTORY

ND EAST
FILES SUPPLIED
TA SHOWN

ONIA ILLINOIS.
1:250,000
OND GRID.
PE MEASUREMENTS.

500 0 500 1000
scale feet

MAY 21 1996

REV	DATE	DESCRIPTION	DR BY	CHK BY	RVW BY

PROJECT:

RNC

RUETGERS-NEASE CORPORATION
MIDDLE FORK OF LITTLE BEAVER CREEK
SALEM, OHIO

CHEMISTRY AND ECOLOGICAL INFORMATION MIDDLE FORK OF LITTLE BEAVER CREEK

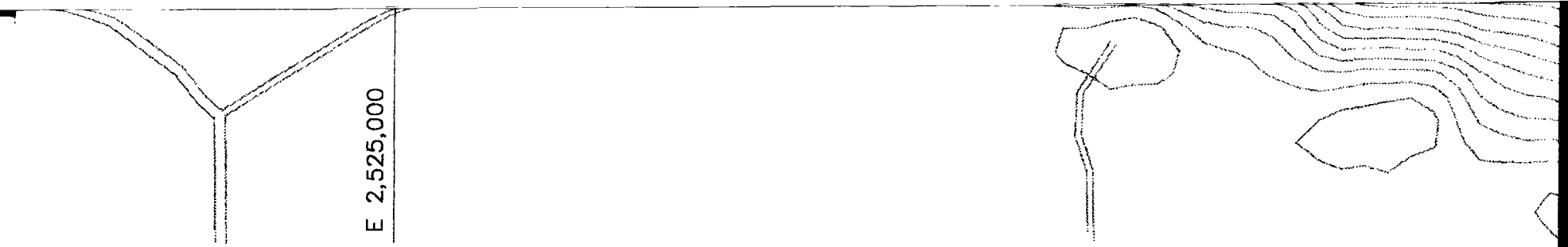
(Sheet 8 of 9)

Golder Associates
Mt. Laurel, New Jersey

PROJECT No.	933-6154	
CLIENT PROJ. No.		
DES BY	EAD	04/10/96
DR BY	JSG	05/20/96
CHK BY	EAD	05/23/96
RVW BY	RSF	5/23/96

FILE No.:	OH01-494
DRAFTING SUBTITLE:	13
SCALE:	AS SHOWN

FIGURE 9



500 0 500 1000

scale feet

MAY 24 1996

REV	DATE	DESCRIPTION	DR BY	CHK BY	RVW BY

AM SURVEY POINTS,
ASTERN STATES
. HABITAT INVENTORY

AND EAST
FILES SUPPLIED
ATA SHOWN

DONIA ILLINOIS.
. 1:250,000
COND GRID.
OPE MEASUREMENTS.

PROJECT:

RNC

RUETGERS-NEASE CORPORATION
MIDDLE FORK OF LITTLE BEAVER CREEK
SALEM, OHIO

CHEMISTRY AND ECOLOGICAL INFORMATION MIDDLE FORK OF LITTLE BEAVER CREEK

(Sheet 9 of 9)

Golder Associates
Mt. Laurel, New Jersey

PROJECT No.	933-6154	
CLIENT PROJ. No.		
DES BY	EAD	04/10/96
DR BY	JSG	05/20/96
CHK BY	EAD	05/23/96
RVW BY	RW	5/23/96

FILE No.:	OH01-495
DRAFTING SUBTITLE:	13
SCALE:	AS SHOWN

FIGURE 10

REV	DATE	DESCRIPTION	DR BY	CHK BY	RVW BY

MAY 24 1996

PROJECT:

RNC

RUETGERS-NEASE CORPORATION
MIDDLE FORK OF LITTLE BEAVER CREEK
SALEM, OHIO

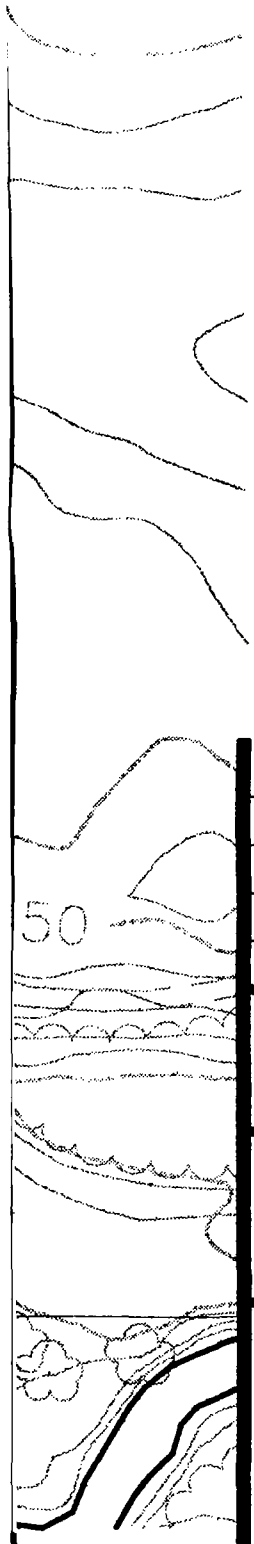
SHEET TITLE:

PHASE II AREA 2 SAMPLING LOCATION PLAN

Golder Associates
Mt. Laurel, New Jersey

PROJECT No.	933-6154		FILE No.:	OH01-511
CLIENT PROJ. No.			DRAFTING SUBTITLE:	13
DES BY	EAD	05/13/96	SCALE:	AS SHOWN
DR BY	JSG	05/20/96		
CHK BY				
RVW BY				

FIGURE 11



100 0 100 200

scale feet

REV	DATE	DESCRIPTION	DR BY	CHK BY	RVW BY

MAY 24 1996

PROJECT:

RNC

RUETGERS-NEASE CORPORATION
MIDDLE FORK OF LITTLE BEAVER CREEK
SALEM, OHIO

SHEET TITLE:

PHASE II
ALTERNATE AREA 3 SAMPLING LOCATION PLAN

Golder Associates
Mt. Laurel, New Jersey

PROJECT No.	933-6154		FILE No.:	OH01-510
CLIENT PROJ. No.			DRAFTING SUBTITLE:	13
DES BY	EAD	05/13/96	SCALE:	AS SHOWN
DR BY	JSG	05/20/96		
CHK BY				
RVW BY		5/23/96		

FIGURE 12

MAY 2

REV	DATE	DESCRIPTION	DR BY	CHK BY	RVW BY

PROJECT:

RNC

RUETGERS-NEASE CORPORATION
MIDDLE FORK OF LITTLE BEAVER CREEK
SALEM, OHIO

SHEET TITLE:

PHASE II
AREA 5 SAMPLING LOCATION PLAN

Golder Associates
Mt. Laurel, New Jersey

PROJECT No.	933-6154		FILE No.:	OH01-509
CLIENT PROJ. No.			DRAFTING SUBTITLE:	13
DES BY	EAD	05/13/96	SCALE:	AS SHOWN
DR BY	JSG	05/20/96		
CHK BY	EAD	5/21/96		
RVW BY	[illegible]	5/22/96		

FIGURE 13

Attachment N1

Indiana Bat Habitat Survey: Middle Fork Little Beaver Creek
Salem, Ohio

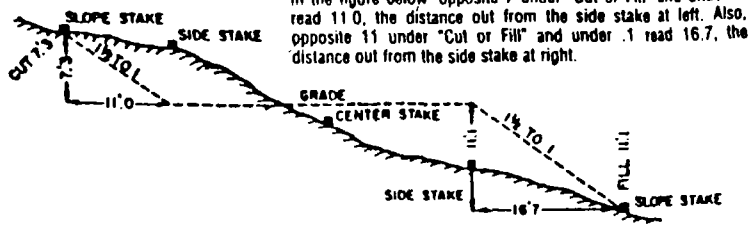
ATTACHMENT N1 - A

FIELD NOTES

DISTANCES FROM SIDE STAKES FOR CROSS-SECTIONING

Roadway of any Width. Side Slopes 1½ to 1.

In the figure below opposite 7 under "Cut or Fill" and under .3 read 11.0, the distance out from the side stake at left. Also, opposite 11 under "Cut or Fill" and under .1 read 16.7, the distance out from the side stake at right.



Cut or Fill	0	.1	.2	.3	.4	.5	.6	.7	.8	.9	Cut or Fill
	Distance out from Side or Shoulder Stake										
0	0.0	0.2	0.3	0.5	0.6	0.8	0.9	1.1	1.2	1.4	0
1	1.5	1.7	1.8	2.0	2.1	2.3	2.4	2.6	2.7	2.9	1
2	3.0	3.2	3.3	3.5	3.6	3.8	3.9	4.1	4.2	4.4	2
3	4.5	4.7	4.8	5.0	5.1	5.3	5.4	5.6	5.7	5.9	3
4	6.0	6.2	6.3	6.5	6.6	6.8	6.9	7.1	7.2	7.4	4
5	7.5	7.7	7.8	8.0	8.1	8.3	8.4	8.6	8.7	8.9	5
6	9.0	9.2	9.3	9.5	9.6	9.8	9.9	10.1	10.2	10.4	6
7	10.5	10.7	10.8	11.0	11.1	11.3	11.4	11.6	11.7	11.9	7
8	12.0	12.2	12.3	12.5	12.6	12.8	12.9	13.1	13.2	13.4	8
9	13.5	13.7	13.8	14.0	14.1	14.3	14.4	14.6	14.7	14.9	9
10	15.0	15.2	15.3	15.5	15.6	15.8	15.9	16.1	16.2	16.4	10
11	16.5	16.7	16.8	17.0	17.1	17.3	17.4	17.6	17.7	17.9	11
12	18.0	18.2	18.3	18.5	18.6	18.8	18.9	19.1	19.2	19.4	12
13	19.5	19.7	19.8	20.0	20.1	20.3	20.4	20.6	20.7	20.9	13
14	21.0	21.2	21.3	21.5	21.6	21.8	21.9	22.1	22.2	22.4	14
15	22.5	22.7	22.8	23.0	23.1	23.3	23.4	23.6	23.7	23.9	15
16	24.0	24.2	24.3	24.5	24.6	24.8	24.9	25.1	25.2	25.4	16
17	25.5	25.7	25.8	26.0	26.1	26.3	26.4	26.6	26.7	26.9	17
18	27.0	27.2	27.3	27.5	27.6	27.8	27.9	28.1	28.2	28.4	18
19	28.5	28.7	28.8	29.0	29.1	29.3	29.4	29.6	29.7	29.9	19
20	30.0	30.2	30.3	30.5	30.6	30.8	30.9	31.1	31.2	31.4	20
21	31.5	31.7	31.8	32.0	32.1	32.3	32.4	32.6	32.7	32.9	21
22	33.0	33.2	33.3	33.5	33.6	33.8	33.9	34.1	34.2	34.4	22
23	34.5	34.7	34.8	35.0	35.1	35.3	35.4	35.6	35.7	35.9	23
24	36.0	36.2	36.3	36.5	36.6	36.8	36.9	37.1	37.2	37.4	24
25	37.5	37.7	37.8	38.0	38.1	38.3	38.4	38.6	38.7	38.9	25
26	39.0	39.2	39.3	39.5	39.6	39.8	39.9	40.1	40.2	40.4	26
27	40.5	40.7	40.8	41.0	41.1	41.3	41.4	41.6	41.7	41.9	27
28	42.0	42.2	42.3	42.5	42.6	42.8	42.9	43.1	43.2	43.4	28
29	43.5	43.7	43.8	44.0	44.1	44.3	44.4	44.6	44.7	44.9	29
30	45.0	45.2	45.3	45.5	45.6	45.8	45.9	46.1	46.2	46.4	30
31	46.5	46.7	46.8	47.0	47.1	47.3	47.4	47.6	47.7	47.9	31
32	48.0	48.2	48.3	48.5	48.6	48.8	48.9	49.1	49.2	49.4	32
33	49.5	49.7	49.8	50.0	50.1	50.3	50.4	50.6	50.7	50.9	33
34	51.0	51.2	51.3	51.5	51.6	51.8	51.9	52.1	52.2	52.4	34
35	52.5	52.7	52.8	53.0	53.1	53.3	53.4	53.6	53.7	53.9	35
36	54.0	54.2	54.3	54.5	54.6	54.8	54.9	55.1	55.2	55.4	36
37	55.5	55.7	55.8	56.0	56.1	56.3	56.4	56.6	56.7	56.9	37
38	57.0	57.2	57.3	57.5	57.6	57.8	57.9	58.1	58.2	58.4	38
39	58.5	58.7	58.8	59.0	59.1	59.3	59.4	59.6	59.7	59.9	39
40	60.0	60.2	60.3	60.5	60.6	60.8	60.9	61.1	61.2	61.4	40

Ed Odenkirchen and

Name Tom Angus

Address ENVIRON Corp

4350 North Fair Fax Dr Arlington VA

Phone 703 - 516 - 2300

Project RN: Salem

Field Notes

CONTENTS

PAGE NO.	REFERENCE	DATE

10/17/93 7:00 Arrived at RN site No B&V or Ed here
7:15 Arrived at Allen Road No B&V or Ed here
7:30 Returned to RN Site Met w/ B&V people

7:45 @ Allen Road Observed Great blue heron Woodchuck

Point ① on Creek along Allen Road Opposite Crane Dermody, Ash Dominated
Complete Canopy Closure from This point Down
Fox Den Red Tailed Hawk
Kingfisher
Iden Tree Ec Foliage P.
West: American Elm ~~Beech~~ Dominates 75 ft/ac
Green Ash 5 ft/ac
sited Chipmunk
East Other side Ash dominates 80 ft/a
Elm ~~Beech~~ 20 f/a
Closure is total

4
Fox den between Allan Road and Point. White tail deer trails old beaver sign
dead trees, standing deadwood
complete overhang from point 1 to Allan Rd

West of Allan road, stands of large beech and oak.
one shagbark hickory 200 yards west of Allan Rd
drove along creek west to state highway, cover continuous, large beech + oak continue to dominate.

Intersection of creek with rt 602, many dead trees.
racoon sign under bridge
Fix tracks
Minnow

Point 2
West: very little tree cover on west side of bank. Corn field
thin strip of trees, white ash, black cherry
East: white ash = 70 ft/ac
black-cherry 20 ft/ac
Deer tracks
standing deadwood.
ash dominant.
overhang - completely encloses.
dead trees, one shagbark hickory
one black willow between point 2 and road, 16 inch DBH
otter or muskrat tracks +
den between point 2 and road
cover ends 50 yards south of road

North side of highway numerous dead elms, forest canopy begins 80 yards of road.

10 AM Left Joe C. From Black + Veatch to pick up rental car.

Point 3

complete canopy over hwy facing downstream:
L = left side
R = right side

Left:
Basal area
Box Elder = 45 Ft/acre
black cherry = 15
~~black willow~~
some standing deadwood.

right:
black willow > 16 DBH
~~walnut~~
standing deadwood. 5 trees, exfol bark
~~white~~ ash = 15 Ft/acre
Box elder = 18 Ft/acre
white tail deer

3A 50-60 paces w/o canopy overhang then shift into maples (sugar) on left ash + scrub on right

3B
Large Black willow - dead possible otter run.

3B canopy opens up for 100 yards (at bend approx ~~2~~ 0.4 mile before pine lake run. then black cherry, elm, ~~white~~ silver maple, ~~silver~~ maple, red maple mosaic on left.
right, black willow > 16, scrub.

Suitable with intermittent canopy to 25 yards of road
white tail deer
black bear chickadee
pileated woodpeckers, fox burrows, crows.

4 Frost

Pine Lake Road

Frog, raccoon tracks
continuous canopy
black willow
mixed trees

Mink Feces (good ID ED!)
aspen, fish

transition to more maples
red, sugar 200 yards down

0.1 mile from Pine Lake rd,
Lots of box elder
break in canopy for 25 yards.
power lines cross creek.
2 Black willow dbh > 16,
standing deadwood cardinal
Cottonwoods, mixed
Lots of maple, box elder, ash
elm dbh > 16
beaver or muskrat

0.3 mile from Pine Lake rd, little
red oak bend after long straight
standing deadwood.
canopy still complete
elm.
beech DBH > 16
other seat
many large trees DBH > 16

beaver sign, piliated woodpecker
standing deadwood.

~ 0.25 mile upstream of point 4. Deer tracks
black duck
50 yards, another black duck

Point 4

overstory complete
Left: several sycamore dbh > 16
sycamore ba = 60 ft/acre
Silver maple = 35 ft/ac
red maple = 5 ft/acre
box elder 25

right:

red maple:

3 red oak
sugar maple
steepness of bank precludes
bitternut

3 shagbark hickory

huge dead standing dbh >16
exfoliated bark.

---

break in canopy 50 ft
then 50 ft canopy, then
50 ft open
intermittent canopy next
200 yards
maple, beech
numerous trees >16 inch DBH
canopy stops @ 300 yards
from station 4
suddenly becomes shrub/scrub.

Great Blue Heron -
For 810 feet below
canopy break shrub, scrub,
Isolated sycamores on
left bank at 810 feet
and small black cherry
but still remains open

Point 5

0.1 mile ~~from~~ downstream
of Goshen road
intermittent canopy
box elders, sycamores,
one large locust?
not enough trees for bigleaf
~~can~~ canopy has complete
coverage in spots
200 feet down becomes
closed canopy
box elder, sycamore, black willow
no standing deadwood in sight

wastewater effluent pipe emptying
organic material from
trailer park into creek.

2nd pipe emptying 50 Ft further down.

Large dead tree past wastewater effluent pipe

Lots of organic material in water

route 165 crosses creek

Canopy remains complete 50 yards from rt 165

Canopy opens for 50 feet, then closes

Lots of maple

black willow dbh > 16

50 yds down canopy opens for 50 Ft

~1/4 mile from rt 165

6 red maple with large cavity dbh > 16

Canopy becomes more open

Point 5B Foot Bridge

maples become more dominant, sycamore, willows

canopy opens up for 200 yards closes back in after 50 yds. From intermittent to full canopy. maples more dominant.

deer & raccoon tracks

great blue heron

Point 6 on next page

Point 7

Tree types similar to Point 6

Continues between 6 & 7

Complete overhead

Left: Sycamore = 45 Ft²/ac

beech = 35 Ft²/ac

sugar maple = 5

butternut hickory = 10

many trees dbh > 16 inches on both right & left

Right:

beech = 45

sugar maple = 35

continued on next page

Point 6

L: sugar maple = 90 ft²/ac
white ash = 15 ft²/ac

R: beech = 10
blank willow = 40
sugar maple = 30
elm = 15.

over hang complete
not any standing deadwood

blank willow seven cavities,
one hollow branch dbh >16

1/2 mile from point 6
cover remains same
sweet standing deadwood

Tributary coming in
right after point 7
Does through same cover type

10/17/13

other side of middleton rd
cover remains same in creek
at 8:00 AM left hotel 9:15 P

7B tributary remains almost
completely dry, even in
rain storm.
box elders, maples, still
complete canopy overhang

Point 8

Left: Ash = 35 ft²/ac
Blank cherry = 5
Sycamore = 20
one bitternut hickory
many dead trees standing,
exfoliating bark, complete canopy
Canopy 20ft

right:

sycamore = 50 ft/ac
black willow = 10
red maple = 5
no dead trees visible on right
small slat on right with no canopy for 50ft, then canopy complete again.

200 yards down in right
200ft before bridge
big pile of railroad ties.

canopy opens up at foot for 200 ft, then line of trees, agricultural land behind it. then closes back up again with good canopy cover after 200 ft.

0.2 mile past foot bridge, agricultural land, intermittent trees spaced out 15-25

yards from each other, a few standing deadwood, exfoliating bark (Top of Map 4) - lots of excavation on left bank.

8B bridge. cover remains open, intermittent trees, agric. land. drainage pipe on right. just before bridge, no effluent shrub/scrub after bridge

next bridge 0.1 mile from other bridge, trib coming in on right has water in it not well treed. 1km up it becomes forested. only sheen on water. sulfur smell (silty muck bottom).

8C begins to close in again

Left
black walnut = 90
red maple = 10
sycamore = 5

No dead trees, no trees dbh > 16

Right:
1 dead shagbark hickory, cavity

numerous trees w/ dbh > 16

box elder: 10 ft²/ac
black willow = 5 ft²/ac
black walnut = 45 ft²/ac
sycamore = 15

over hang 13 ft, then becomes more complete.

0.1 mile past 8C
some kind of farm machinery road goes through creek, no bridge significant

runoff + erosion

Point 9

Same as 8C

no standing dead trees visible
maples become more predominant, lots of sycamore
lots of trees w/ DBH > 16
Downstream of point 9
0.1 mile less overhang
large fish (carp?)
Houses, less forested.
small patches of oily sheen on water,

small 9 inch drainage pipe on right just before road

bridge.

complete canopy overhang
after bridge, heavily trod.

0.1 mile on right
small tributary 1 ft wide
overhung with blackwillow
then canopy thins a little
but still overhung
becomes much more open after
100 ft

B
0.3 mile down over similar
beaver sign.
beaver dam 50 ft down.
becomes intermittent
canopy

2nd beaver dam 200 ft
down.
couple of standing dead wood
100 ft down from dam

Carp carp, ~~ea~~ 2 mallards

Point 10 unbelievably
heavily treed

L:
EIm = 60
beech = 10
sycamore = 5
almost complete overha.
both sides (15-20 ft)
+ some completely over

R:
Sycamore = 40
EIm = 50
box elder = 10
black cherry = 5

~~[redacted]~~ a few standing
dead wood + full brush
+ conifers

0.6 mile down
a few sharp bank / hickory
more open near power lines

Point 11

L: Black willow = ~~5~~ 10
Box elder = 10
~~1 [illegible]~~.

R:
Bitternut Hickory =
White ash =
narrow line of trees,
can't do bank area.

intermittent breaks in
[illegible]
no standing deadwood visible
either side.
overhang intermittent is 6-ample
~~Big dish on left~~

Big Island on left
just after point 11

~~200 yards to~~
~~be comfy~~
200 yards
right bank begins to
have more
a few cottonwoods
100 ft next bend:
more overhang, big bank
willows trees denser
on bank
lots of sugar +
silver maples
large carp.
12:02 AM reached
~~[illegible]~~
middletown rd.
Small group overhang
past middletown rd
Big Island, dead tree
Lots of dead trees

24

#1:10 PM

Point 12

L: Beech: 110
Silver maple: 5 red oak = 5
elm: 15
Complete canopy overhang
two standing dead trees small

R: Single line of trees abutting a corn field
red maple, ash, box elder
no basal area individual trees.

Point 12 is at tributary coming in on 6 Ft about 1/4 mile from middletown road.
tributary good size, several feet wide, heavily treed
opens up just past point 12, 5m
several big sycamores, lots of little black willow

Took out at 1105
1430 PM

Point 13

canopy overhang complete

L: silver maple 40
red maple 15
elm 5

R: Elm = 15
(1) maple = 25

Green Ash #5

numerous trees both sides
Large dead trees with no foliage
base on right.

left large area of dead
trees 200 yards beyond creek.

scouted put in/pull out
points until 5:30 PM.

10/18 6:00 AM Left, to
drop off car downstream
6:50 AM arrived at
Pine Lake road to put in.

For 0.25 mile past
bridge, intermittent cover,
Bl willow, box elder, maple
some standing deadwood, many
trees w/ DBH ≥ 16
territory on right 200 ft from
drains large stand of maple

bridge, large beaver dam,
beaver lodge, saw the beaver.
several ducks, couldn't see
what kind
creek has become much
deeper and wider in the
last mile.
shrub/scrub mixed with more
treed area
intermittent canopy.
Canadian Geese 14

Power lines / Point [illegible]

many standing dead trees
within a few hundred yards of
right bank. mostly shrub/scrub
on both sides, not enough
doing a basal area, Cover type(s)
pretty consistent between

Point 14 300 Ft. below power lin

R: red maple = 40

28

Elm = 15
Green Ash = 10
silver maple = 5
Canopy / canopy becomes more dense.

L:
red maple = 60
silver maple = 20
Green ash = 10

only stream from coming ditch

one dead tree w/ exfoliated bark on either bank. Many American geese. Good canopy - complete over head.
tributary coming in at left, shepard ditch. significant water flow, drains area of silver and red maples.

---

complete canopy
down stream of 14
many, many dead trees standing

two successive tributaries on right, no water in them

Great Blue Heron
Canopy extends completely over creek ~ about 30 feet.
much standing dead wood, hollows, exfoliated bark
many maples, elms.
small groundwater flows in bank from surrounding wetlands
canopy opens up for about 200 yards.
saw white tail deer drinking from creek

Point 15 new second set of pins was crossed today and set does not appear on map

R: red maple = 55
Elm = 10

30

one standing dead tree.
many trees dbh >16
canopy complete most of way along

L:
red maple = 45
silver maple = 5
Elm = ~~10~~ 10
black cherry = 20

many trees dbh >16
one standing dead tree.

0.2 miles past point 15, canopy opens up, only intermittent cover past 9 feet from either side (creek about 30 wide)
Large wetland areas on either side of creek, many standing dead trees.

0.7 mile past 15

counted 18 turkey vultures on several adjacent trees right by creek

tributary on right lots of iron in it, possibly groundwater draining.
large dead tree on right 100 ft further down, hollows, exfoliating bark

bridge → RT. 14.
canopy opens up 50 yards before bridge, closes up 30 yards after

Point 16

0.2 miles downstream of RT 14.
Primary standing dead trees
small tributary with water flowing in it

Sugar maple = 50
Red maple = 10
silver maple = 5
black cherry = 10
black walnut = 5
black willow = 5

L: elm = 5
black willow = 20
sycamore = 10

Complete canopy closure.

For 2 → 300 yards in left very open, canopy on right continues to extend about 9 feet
Kingfisher

0.3 mile from ct. 14 bridge, it has significantly opened up on both sides

after ~~[illegible]~~ 3rd bridge canopy closes up again 9-12 feet on the side - just below large spillway
saw Great Blue Heron

lot of Junk automobiles on left side.

many standing dead trees on right.
and Great Blue Heron

0.4 mile from last bridge opens up, farmland on left. a few black willows on right very sparse overh very long black willows on right
tributary on left draining wetland.
dead deer in the creek.
2 cardinals
ducks

several isolated stands of red maple on right

tributary on left

back of trail on left, propane tanks, cinder blocks

stand of weeping willows on left 100 ft away, black willows on right

House on left lots of bare soil, erosion, septic field close to creek

Take out 11:25 AM

Big Auto graveyard + drums on ~~Gibbon Rd~~ rt 14 just before Gibbon rd, on left side of creek.

17 skipped because no bird area

Point 18 500ft below bridge rd.

R: Black walnut = 10
elm = 10
red maple = 5

several standing dead intermittent

small trib on left — appears to be groundwater sp

Black + Veach guys saw an otter

L: thin of red maples, then opens up right after the shrub/scrub, emergent lots of willow!

not much on other side with DBH > 16

100 yards down black willows

0.3 mile below road

Large beaver dam by island shown at map

small tributary on left enter island 2 ft wide, only 6-8 inches of water, draining scrub/shrub then tributary on right 200 Ft down. large then and small both draining maples many standing dead trees left + right.

great Blue Heron

0.6 mile below Point 18

stretch of agricultural land on left for 1/4 mile intermittent trees + wetlands on right

duck

many standing deads, intermittent canopy

left - ag land w/ thin strip of trees along creek

Great Blue Heron

Point 19

becomes more heavily treed both sides. maples

Rt: Elm = 10 red maple = 5
sugar maple = 30
no standing dead.

canopy thins out across 15 ft complete. 3 with dbh > 16.

Lt: strip of trees 100 ft, wide, then becomes pasture behind.

sugar maple = 50
red maple = 35
black cherry = 5
bitternut hickory = 15
red oak = 5

one standing dead.

5 with dbh > 16

complete canopy overhang

0.1 mile down opens up a little, but still complete canopy old concrete structure on left just past that.

50 ft down Fox scat on snag. big standing deadwood on right

opened up near 344 for 200 yards then closed back up

just before RR Bridge it opens up on both sides road along left. very close to creek small runoff tribs. large dead standing on right several D.C.'s

small bridge past RR bridge really opens up, no canopy at all. Big Carp road right at edge of creek

large tributary drainage open area on left runoff from the road no trees overhanging

large oak with dead limbs on right - set back from water, doesn't overhang

on left large asphalt piles several big willows on right + left back from creek.

Point 20

still very open, grass. one huge black willow, overhangs 30 ft, creek about 35 ft wide only tree overhanging

for 400 yards upstream as far as site (100 yards) downstream.
several Ducks
200 yards further down, dirt road to edge of creek on right, large mound of soil next to it, alot of runoff, + erosion
numerous muskrat burrows in banks

Point 20B

several dead standing on left. all pasture, shrub/scrub on the right, no lge trees on right.

Est:
L: black cherry = 6 trees
dbh = 6 trees
1 small sugar maple
canopy overhang 5 feet on left.
opens up again after 100 yards.
then 150 Ft further it closes up again

Point 21

Left: one standing dead trees visible
one trees either side with dbh > 16
black cherry = 90
Elm = 55
Sugar maple = 10
one tree 12 Ft overhang
no other trees overhanging.
small tributary on left
trickle of water down steep bank

42

Right:

~~understanding~~ dead.

Black walnut: 45
box elder = 10
Locust = 5
sycamore = 10
elm = 5

1 Tree DBH > 16
1 standing dead wood
no overhang on the right
small willows on both sides.

1 great Blue Heron nests in large sycamore on the right

0.5 mile past point 21 just before heron rookery, begin to get significant overhang again

43

100 ft down, permits yard / pasture field / for 100 yards

opens up at power lines, becomes more treed on right afterwards, but still open on left

Point 22

0.2 mile past power line becomes more heavily treed both sides

R: silver = 45
box elder = 10
no standing deadwood
3 5 dbh > 16

L: silver maple = 55
Elm = 10
black cherry = 10
black willow = 5

two standing dead wood
6 with DBH >16

Intermittent overhang
both sides.

Tributary comes in on right
just below point 22
drains black walnut + silver maples
overhang 20 ft.)

Creek about 40 ft wide

about 18 inches wide,
6 inches deep

just below that 5 standing
dead in left, large
dead black walnut on right.

Then large dead black
walnut on left

10/19/93

6:50 AM Arrived at R+4
after dropping off car
downstream. Ready to go
at 7:15 AM. Waited for
B+V to get ready to
go until after 8:00 AM

On previous day noted
slag/asphalt → area along
creek at Butcher Road

Tributary comes in on left
just below bridge, drains
road, maple area.
just below that pipe on left
about 6 inch diameter discharging
small amount of effluent
many standing dead
1st house after bridge on right,
large piles of
coal, construction debris
several houses on right,
canopy completely overgrown
many silver maples

House on left, more houses on right, small tributary on the right draining ~~on~~ small maple stand on right, large dead tree on right, hemlocks on right many cottonwoods, maples predominantly maples, a few cottonwoods + elms

many hemlocks on steep slope on left right on floodplain, some beech.

Point 23 0.8 mile below rt 45

L: red oak = 5
beech = 15
tulip poplar = 5
elm = 5
silver maple = 10
red maple = 10
one standing dead

6 with DBH > 16

overhang about 20 ft
width of creek 50-60 Ft

R:
sugar maple = 45
red oak = 10
beech = 5
slippery Elm = 5

5 trees with dbh > 16
2 standing dead & dead.
overhang 30 ft

Powerlines cross, 2nd visited at drum # on creek today. Lights # hemlock on left, standing dead wood on right

Motorcross track on right

3rd drum

48

tributary coming in
on right, draining
stand of maples

Covered bridge small
open area right
under the bridge.

unidentified species of magnolia
below covered bridge, maybe cucumber magnolia

Point 24

0.5 mile
below covered bridge.

L: Cottonwood = 5
bitternut Hickory = 5
silver maple = 50
sycamore = 15
American elm = 15

no standing deadwood visible
overhang is complete to partial

1

Creek 15-40 ft wide.

8 with DBH > 16

R: Hemlock = 20
cottonwood = 5
beech = 5
River Birch = 5
Red maple = 10
witch hazel = 5

6 with DBH > 16
no standing deadwood

just below Point 24 stand dead w/ cavities.
small tributary on right, no water in it
otter scat on rock

Tributary on right
about 0.6 mile below covered bridge.

L: [illegible]
tulip poplar = 15

Sycamore = 55
silver maple = 20
red maple = 5
Sugar maple = 5
overhang complete
10 trees dbh > 16
no standing deadwood visible.

R: Sugar maple = 35
Am Elm = 5

4 dbH > 16
no visible standing dead.

significant flow

8-10 feet wide lots of
riffles, then [illegible]
10-15 ft cobble + sand, leaf litter
for 150 yards to creek.

Point 25

just below tributary on right
beech = 10
R: Hemlock = 10
sugar maple = 30
red maple = 25
Black cherry = 5
red oak = 5
12 DBH > 16
no standing dead visible

L: Beech = 25
Sycamore = 15
Am Elm = 30
Black Cherry = 5
Silver maple = 15
Linden = 5
11 DBH > 16
no standing dead visible

Overhang out as far as
25 feet over the side
creek 50-60 ft wide

Other scat

5a

kingfisher just
below 25 mile
otter seat

2 large standing dead on left -
saw un ID'd fish

0.4 mile down from 25,
tornado damage on right
for 100 yards, large
trees snapped off
200 ft down, sycamore
with several cavities,
a lot of ground water
seepage

tributary on right

Slag heaps in woods
on left

2nd tributary on right

3

Portable

R: Black cherry = 15
red maple = 20
Silver maple = 35
Am Elm = 10
no standing deadwood

19 with OBH = 16

Power lines cross just above
point 2 Ce- Canopy
opens up for 200 feet
then closes up again around
point 26
overhang complete
to Portal

L: large culvert for
stream which appears
to go under track
small dirt road,
railroad railroad track

54 → other side of road.

Blank cherry = 30
Sugar maple = 15
Am Elm = 40
white oak = 5

1 tree DBH > 16
no standing dead wood visible

between road + creek:

Sycamore = 10
silver maple = 100
~~Quaking aspen = 5~~ cottonwood

6 DBH > 16
no standing dead visible
overhang partial to complete

2 houses on edge of creek on left just before Bridge

Arrived at take out
11:40 AM

on the water at 8:00
complete coverage below the bridge:

King fisher
Great Blue Heron.
numerous noises behind stands of trees on left
King Fisher.
large dead sycamore w/ cavities about
~~1000 ft before pt~~
400 ft before pt

Point 27

Just ~~[illegible]~~ below power line

L: silver maple = 45
Am Elm = 30
Black Cherry = 15
sugar maple = 5
butternut hickory = 5

7 DBH > 16

no visible standing

Partial to complete overhang
7-23 feet on left

R: white oak = 5
Hemlocks = 35
sugar maple = 20
red maple = 10
Sycamore = 5
Black Cherry = 5
~~[illegible]~~ ~~5~~

slippery Elm = 5
beech = 25
16 DBH > 16

No visible standing Dead

Canopy 8-20 ft

look width 60 feet

Canopy complete
Just ~~[illegible]~~ below point 27

1 mile down Large standing dead tree, ex fol bark (right)
1 yd further small ex stand dead

Red winged hawk
[illegible]

5

below power line n[illegible]
hemlocks, flatter [illegible],
more sycamores
and a few black willows

open area on right
for 200 ft

tributary on right
Standing dead on right

→ 4 ft wide 4 inches deep
pool as deep as

Sycamore = 40
Black cherry = 20
Silver maple = 20
→ all the way around both
circles, can't get
out, private property.

pool as deep as 18 inches

tributary is about
700 ft above
[illegible] road

2 standing deads on
right just above
[illegible] road.
opens up for 100 ft
around bridge

Point 28

L[illegible] silver maple = [illegible]
Sycamore = 20
Black cherry = 15

B DBH > 16
mostly dense [illegible]
[illegible] Hemlocks just
[illegible] bridge, [illegible]

on truck stopped + watched for long time

R = Sugar ~~maple~~ maple = 15
black cherry = 10
red maple = 10
sycamore = 10
~~[illegible]~~
silver maple = 10

9 trees dbh > 16
no standing dead

canopy overhang complete

2 large trees ~~[illegible]~~
standing dead w/ exfol bark on left
400 ft below point 28
bank on left steeper
with numerous hemlocks

50 ft below pt. 28
Huge dead standing Hemlock 50 ft down on right
~~After~~ Immed. after that ~~[illegible]~~
creek widens to 80 ft, complete ~~to str~~ / interm. overhang. wetland areas

large dead tree on right, exfoliating bark

~~[illegible]~~ 300 yds, beyond mostly silver, sugar maple
sycamore
Great Blue Heron
[illegible] hung trees
DBH > 16

Some houses both sides
near spillway canopy
between mark
intermittent
kingfisher.

discharge pipe (4 dia
diameter) by footbridge
on right

Ed says take out
it "well cultivated
park like setting"
about 200 yds long
behind are sycamores
red sugar maples, hickory
tulip poplars

spillway

walking right bank
several large standing
dead wood trees
dbh = 4'

Point 29

200 ft below spillway

R: sugar maple = 40
red oak = 5
sycamore = 10
tulip poplar = 15
elm = 5
silver maple = 10

17 dbh > 16

overhang = 25 ft

L: overhang 20 ft
creek about 50 ft wide

sycamore = 45
red oak = 10
black cherry = 5
sugar maple = 25
silver maple = 10
hickory sp? = 5

Cottonwood = 10

12 trees DBH > 16
no standing dead visible

drainage conduit under
bridge on left.

2nd small drainage on
left 80 ft below
bridge

650 ft below bridge,
park like area on
left, under [illegible]
maples + sycamores.
right continues to
have [illegible]
overstory w/ silver
maples + sycamores

~~[illegible]~~
park on left extends
to 1400 ft past
bridge, then point [illegible]

Point 30

L: overhang becomes
about 20 feet with
honey locust = 20
red maple = 15
silver maple = 15

10 trees DBH > 16
groundhog burrows

Large standing dead
with [illegible] trees on right
bank

Point 31
2100 ~~feet~~ below pt 30 [illegible]
a few scattered trees on
left

L: silver maple = 25
black willow = 30
Honey locust = 25
overhang to 25 ft

6 DBH > 16 no
understory well [illegible]

100 Ft above next bridge sewage / stormwater effluent pipe discharging on left, strong sewage smell.

→ State Route 164 raccoon scat under bridge on right

Point 33

just above rt 164:

R: 2 DBH > 16 no stand dead
black willow = 10
silver maple = 20
Elm = 10
29 Ft overhang

L: silver maple = 35
black willow = 10
1 DBH > 16, thin
Lines of trees w/ vines behind overhang = 12
no standing dead visible.

Railroad bridge

right bank of RR bridge for 100 ft is all concrete and gravel.

raccoon tracks under RR bridge.

no significant trees on left all the way down to next road

R: significant forest cover begins below concrete gravel bank of Kiln.

steep banks on right

68

Point 33

Across from sand + gravel plant 500 ft up from rd.

R: Cottonwood = 15
Am Elm = 10
Slip Elm = 5
Red oak = 10
black cherry = 5

3 standing deadwood
5 OBH >16

R canopy over hwy to 30 ft

~~R~~ ~~Edge~~

R: Large 2 ft diameter drainage pipe from sand + gravel & bed rock, significant effluent
Large oil tanks + drums on property
Large earth moving machinery

Cover ends by road m
right, begins again after
road → Market street

Ed says petroleum smel
on left (I can't smel
it, Ed has cold & bu
claims it's only
in chest)

Lisbon Hist and
Albco Foundary
just above
market, red brid
on right

70

7

Point Source I.D.

G-3

1. Pipeline Station upstream of wastewater treatment Plant. Creek is Really small

0.4 mile

2. Southeast of Route 45 overpass over PA Avenue
   - 13 Worthington Custom Plastics
   - 13 backs up to ephemeral Portion of MFLBC upstream of Pipeline Station
   - lots of Free standing chemical Tanks

3. Industrial Park North the MFLBC Downstream of the Route 62 access Road Salem Parkway:
   - Cardinal pumps + exchangers
   - Redex Industries (lots of drums + tanks)
   - Lowery Tool and Die

→ Salem Industrial Park

TC

Beechwood Road:
Numerous horses, ~~agriculture~~
a few agricultural fields.

Goshen Road:
Trailer Park: → waste water effluent
Colonial Villa

across creek from Trailer Park, gas pumping tank + station

Rt 165 near creek → Golf construction place, heavy machinery
200 yards from creek
200 yards other side of creek, another gas pumping station for pipeline.

Intersection of 165 and 45
small airport → Salem airpark

North on rt 45
passed creek mixed residential and agricultural around creek

Turned onto Middletown Road.

at rt 62 + Middletown rd
old petroleum tank and inactive oil pumps on both banks.

agricultural fields east of creek between rt 62 and 165 → corn fields.
west of power lines is wetland

Cardinal Mining rt potential runoff.

Note: Goodman Ditch does not flow into MELBC.

Special Note for Ed:

Goodman Ditch where it crosses CR is only 2 feet wide, 2-3 inches deep, then opens up in big wetland used as pasture, creek is excessively nutrient loaded along Calla Road, completely algae covered creek.

On Rt 14 just before Lisbon road, mining operation on left, auto graveyard on right

along Lisbon road, heavily forested, a few houses

drive down Lisbon road road

In Lisbon end of gra street large Auto Junkyard near creek, potential point sour

End of Jefferson Stree near creek Hayes Oil company. Several barrels, Loading area.

near crossing of creek with rt 30 and 45 in Lisbon Ashland Gas station (Lust Rusted metal tanks behind station.

Sewage treatment plant on east side of town near creek.

rt 154 just east of tow gravel operation on right side of road near creek.

76

where rt 154 crosses creek, creek is heavily forested maples, sycamores, some standing dead wood. ~~Canopy~~ complete to partial overhang.

INDIANA BAT HABITAT SURVEY:
MIDDLE FORK LITTLE BEAVER CREEK
SALEM, OHIO

Prepared for

Ruetgers-Nease Corporation
State College, Pennsylvania

Prepared by

ENVIRON Corporation
Arlington, Virginia

February 1. 1994
Revised May 23, 1996

CONTENTS

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(continued)

I. INTRODUCTION

In 1992, Ruetgers-Nease Corporation submitted to USEPA Region 5 and Ohio EPA a draft Endangerment Assessment Report for the Nease Chemical Company Salem Ohio Site (the site). In response, the Biological Technical Assistance Group produced a series of comments regarding the ecological risk assessment. Among these comments was a suggestion that the Middle Fork of Little Beaver Creek (MFLBC), located in Salem and Mahoning Counties, was within the general geographic range of the federally endangered Indiana bat (*Myotis sodalis*). The comments briefly described the summer habitat requirements of the bat and suggested that the species be addressed in the revised ecological risk assessment. The revised assessment, submitted in July 1993, recommended that MFLBC be surveyed for habitat that could be potentially suitable to the bat. There are no available data to confirm or discount the current or historical use of MFLBC by the Indiana bat and this survey is not designed to provide that information. The survey is intended to confirm or discount the presence of potentially suitable habitat and thereby provide a basis for deciding whether or not the Indiana bat should be considered in the ecological risk assessment.

In October 1993, Ruetgers-Nease Corporation, USEPA Region 5, and Ohio EPA agreed upon a work plan for evaluating MFLBC's suitability as habitat for the Indiana bat. This report presents the results of the field investigation. Interpretation of the results within the context of the ecological risk assessment will be presented subsequently.

A. Status, Biology and Life History of the Indiana Bat

The Indiana bat was placed on the Federal Endangered Species List on March 11, 1967 (32 FR 4001, March 11, 1967). In 1983 The United States Fish and Wildlife Service released the *Recovery Plan for the Indiana Bat* (USFWS 1983) which describes the suspected causes for the species' decline as well as the biology and life history of the organism. Among the suspected causes listed for the decline of the species in the recovery plan are:

1. Natural causes such as flooding and cave-ins of hibernacula;

2. Disturbance and vandalism of hibernating bats;
3. Deforestation and stream channelization;

4. Pesticide poisoning; and

5. Other human activities such as biological studies, commercialization of hibernacula, exclusion of bats or modification of microclimate by the construction of poorly designed hibernacula entrance gates, and flooding by reservoir construction.

The Indiana bat is a medium-sized member of the chiropteran genus *Myotis* with a forearm length of 35 to 41 mm. The head and body length ranges from 41 to 49 mm. The species closely resembles the little brown bat *(Myotis lucifugus)*, but differs in having a keeled calcar (a spur-like projection on the ankle of chiropterans). Other differences include: (1) the hind feet of the Indiana bat tend to be smaller and more delicate; (2) hairs on the hind feet of the Indiana bat tend to be shorter; (4) the Indiana bat has a small sagittal crest; and (5) the braincase is smaller, narrower, and lower in the Indiana bat.

Most Indiana bats migrate seasonally between winter and summer roosts. The U.S. Fish and Wildlife Service reports that seasonal migrations have been recorded between hibernacula in central Kentucky and summer areas in Indiana, Kentucky, Ohio, and Michigan as well as hibernacula in southern Missouri and summer areas in northern Missouri and southern Iowa. Reported migration distances between hibernacula and summer foraging habitats have been as high as 200 miles (Barber and Davis 1969). Figure 1 in USFWS (1983) presents the known and suspected range and locations of important hibernation sites of the Indiana bat. Mahoning and Columbiana Counties, which includes the Nease Chemical Superfund Site and MFLBC, fall within the described range of the Indiana bat.

Prior to hibernation, Indiana bats swarm at the hibernaculum sites. Swarming involves the gathering of large numbers of individuals that fly in and out of the hibernacula entrances but do not roost overnight. Fat reserves critical to over-winter survival are replenished prior to hibernation. It is believed that mating predominantly occurs during swarming but may occur at a limited rate throughout the winter and as bats leave hibernation.

Hibernation extends from October through April. Local weather conditions may affect the initiation and termination dates of the hibernation period.

It is presumed that females store sperm through the winter and become pregnant after emergence from hibernation. Females emerge in late March or early April with males emerging later.

Females give birth to a single offspring in June or July. During this period, females congregate in nursery colonies. Males during this period are dispersed throughout the summer range, however the roosting habits of male Indiana bats are not documented. The young are capable of flight within a month of birth.

Indiana bats feed primarily on Lepidoptera (moths and butterflies) and aquatic insects (Belwood 1979). Aquatic insects such as nematocerans (crane flies, midges, and mosquitos), trichopterans (caddisflies), ephemeropterans (mayflies), and neuropterans (fishflies, dobsonflies, etc.) have been observed to account for as much as 54 percent of the diet of pregnant female bats. After parturition and during lactation, lepidopterans predominate in the diet, accounting for as much as 70 percent of the diet. Foraging ranges from nursery roosts have been reported as 0.8 km by Humphrey et al. (1977) and 1.2 km by Cope et al. (1978).

B. Habitat Requirements

1. Winter Habitat

Indiana bats require specific roost sites in caves or mines that have stable temperatures below 10°C, with a preferred range of 4 to 8°C. Stable low temperatures are critical to the maintenance of low bat metabolic rates and the conservation of fat reserves until emergence from hibernation. Relative humidity of hibernacula has been reported to range from 54 percent to greater than 74 percent.

The temperature requirement severely limits the availability of suitable hibernacula. The structural configurations of individual caves determine the temperature and humidity characteristics required by this species. Figure 1 in USFWS (1983) shows the locations of hibernacula with a recorded population of Indiana bats greater than 30,000 since 1960. [Columbiana and Mahoning Counties are not sites of winter habitat.]

2. Summer Habitat

a) Foraging Habitat

The available data indicate that typical summer foraging habitat of the Indiana bat consists primarily of riparian and floodplain forest areas of small streams in which the canopy extends partially to fully over the stream.

Humphrey et al. (1977) studied the summer habitat and ecology of Indiana bats from a nursery colony in eastern Indiana. Foraging habitat for

this colony was confined to air space from 2 to 30 m high near the foliage of riparian and floodplain trees. During early summer, foraging was restricted to riparian habitat. Later in the season feeding extended to solitary trees and forest edge on the flood plain. Local habitats not used by members of the studied colony included upland forests, open pasture, corn fields, upland hedgerows, and creeks from which riparian trees had been removed.

Gardner and Gardner (1980) studied the relationship of Indiana bat trapping frequency to riparian vegetation and stream morphology for McGee Creek in Pike County Illinois. Indiana bats were most frequently observed in areas of the creek that exhibited mature (greater than 16 inches diameter at breast height (dbh)) riparian trees overhanging the creek bank more than 3 m on one or both sides. Closed canopy over the stream was not a factor for Indiana bat observation. Width of the riparian vegetation zone did not appear to be a factor determining Indiana bat foraging. Similarly, bats were observed over reaches where the creek widths were 9 to 11 m. Creek bottom substrate type and the presence of riffles or pools were not determinant factors.

Dominant trees about which the Humphrey et al. (1977) bats were observed feeding included sycamore *(Platanus occidentalis)*, eastern cottonwood *(Populus deltoides)*, black walnut *(Jugulans niger)*, black willow *(Salix nigra)*, and oaks *(Quercus* sp.). Gardner and Gardner (1980) reported that silver maple *(Acer saccharium)*, box elder *(Acer negundo)*, cottonwood, black willow, and sycamore were the dominant tree species in areas of Indiana bat foraging.

Little data are available concerning the exact prey species utilized by the Indiana bat. However, because the Indiana bat feeds extensively upon emergent aquatic insects during the summer, foraging habitat can be expected to include waterbodies capable of supporting the larvae of such insects.

b) Nursery Roosts

Indiana bats use exfoliating bark and tree hollows as summer nursery roosts. Humphrey et al. (1977) reported nursery colony roosting both under the exfoliating bark of a dead bitternut hickory *(Carya cordiformis)*

and a living shagbark hickory *(Carya ovata)*, as well as in the hollow limb of a cottonwood. However, Humphrey et al. hypothesize that the thermal requirements of developing Indiana bat young result in a preference for the higher ambient temperatures associated with dead trees rather than live specimens for nursery sites. This is supported by findings of the authors that the nursery colony optimized time spent at the dead bitternut hickory tree nursery site which exhibited greater temperatures relative to the live shagbark hickory nursery site. Observations of bark loss on the dead tree nursery site lead the authors to estimate that a typical dead tree offers suitable nursery habitat for six to eight years. Consequently it was suggested that the Indiana bat exhibits the behavioral flexibility to move nursery sites periodically, yet still maintain the same foraging area.

II. METHODS

The methods used to qualitatively evaluate the suitability of MFLBC as potential habitat for the Indiana bat was that described in the September 1993 work plan (Ruetgers-Nease 1993). There were two components of the evaluation: a field survey of riparian vegetation characteristics; and existing Ohio EPA data on benthic macroinvertebrates in MFLBC.

A. Field Survey

Between October 16-20, a team of two biologists from ENVIRON Corporation conducted the field survey. Black and Veatch provided oversight for EPA. A float trip was made along MFLBC from the closest point practical to the site downstream to approximately 0.6 miles (1 kilometer) below the spillway at the town of Lisbon, a total distance of approximately 31 miles.

The riparian vegetation along both banks of MFLBC and its tributaries (extending upstream to about 0.6 miles where conditions allowed) were characterized as follows:

- The dominant cover type (e.g., lower story forbs/grasses, mid-story shrub/scrub, upper-story forest, or wetlands) was determined along the 31-mile stretch of MFLBC and tributaries.

- Tree species were identified and dominance of trees was estimated in forested riparian areas. Species dominance was determined at approximately one-mile intervals along MFLBC and its tributaries. Estimates were made using basal area per the Bitterlich Method and a Cruz-All (Forestry Suppliers, Inc.).

- The presence, and an estimate of prevalence, of trees exceeding 16 inches diameter at breast height (dbh) within line of sight from the streamside was noted at approximately one-mile intervals along MFLBC.

- The extent to which the forest canopy overhangs the creek and tributaries was estimated at approximately one-mile intervals and estimated from a point in the stream directly below the canopy margin to the streamside.

Data from the field survey were then used to define reaches of MFLBC that are potentially suitable as foraging and/or nursery habitat for the Indiana bat. Establishment of these reaches was based on a comparison of the survey findings (i.e, observations made at one-mile intervals as well as on a continuum) with the following habitat criteria:

1. Foraging Habitat

The available published literature describes foraging habitat for adult females and juveniles of both sexes only (Humphrey et al. 1977; Belwood 1979; Gardner and Gardner 1980; USFWS 1983). There is insufficient information regarding adult males. Given this qualification, Indiana bat foraging habitat includes riparian and floodplain forests dominated by sycamore, cottonwood, black walnut, black willow, silver maple, boxelder, and oaks. Optimal vegetation characteristics for foraging habitat includes the presence of riparian zone trees greater than 16 inches dbh and a canopy that extends at least nine feet over the creek from one or both banks. Although the presence of trees greater than 16 inches dbh is a factor characterizing optimal foraging habitat, available published literature suggests that Indiana bats also forage in areas without such individual large trees. Areas of MFLBC developed for agriculture or otherwise devoid of riparian trees would not be considered suitable foraging habitat for the Indiana bat.

2. Nursery Habitat

The available published literature describes Indiana bat nursery habitat as including dead/dying trees with bark exfoliation or cavities, living trees with evident cavities, or tree species with naturally exfoliating bark (e.g., shagbark hickory) within about 0.6 miles (1 kilometer) of streamside riparian areas (Humphrey et al. 1977; USFWS 1983). Optimal nursery structures consist of areas of dead and dying trees with considerable exposure to sunlight. The availability of sunlight was taken into account in the field survey. Only trees with exposure to sunlight were recorded.

B. Ohio EPA Benthic Macroinvertebrate Data

A further refinement, involving the presence of food items, was made to the Indiana bat foraging habitat evaluation. Available data suggest that the Indiana bat's diet is composed of a large proportion of aquatic insects including nematocerans (midges and other aquatic flies), trichopterans (caddisflies), ephemeropterans (mayflies), and neuropterans (fishflies and dobsonflies). Existing Ohio EPA data on macroinvertebrate populations in MFLBC (OEPA 1985) were used to identify reaches that would be likely to support emergent aquatic insect prey.

III. RESULTS

A. Field Survey Results

Table 1 shows the survey results for 32 discrete survey points at approximately one-mile intervals along MFLBC. It should be noted that the left and right bank designations refer to direction as one faces downstream. A comparison of the data in Table 1 with the habitat requirements presented for the Indiana bat indicates that 18 of the 32 survey points had all three of the criteria for "optimal" foraging habitat (i.e., species dominance, tree diameter, and canopy overhang). These points include #3, #4, #6, #7, #13, #17, #20-#23, and #25-#32.

- Thirty-one of the 32 survey points (not Point #19) exhibited at least nine feet of canopy overhang on one or both banks.

- Twenty-seven survey points (Points #3 - #14, #16, #17, #19-#23, and #25 - #32) exhibited dominance on one or both banks by at least one of the tree species reported to provide foraging habitat for the Indiana bat.

- Twenty-three survey points (Points #2 - #4, #6, #7, #13, #15, and #17-#32 exhibited trees with diameters greater than 16 inches.

In addition, 22 of the 32 survey points (Points #1 - #6, #8-#10, #12-#18, #20-#22, #29, #30, and #32) exhibited visible substrates potentially suitable as Indiana bat nursery habitat.

While results for each of the 32 survey points provide an indication of potential habitat suitability along MFLBC, these data should be interpreted with care. The riparian areas surrounding many of these points were highly variable with respect to canopy overhang, species dominance, tree diameters, and the presence of suitable nursery substrates when viewed as a continuum. Because of this variability, observations taken at one-mile intervals do not necessarily reflect the overall habitat suitability of a particular reach of MFLBC. The actual habitat changed over distances that were at times less than 100 yards. In order to limit

TABLE 1
Field Results for Indiana Bat Habitat Survey Along 31 Miles of MFLBC

Point[a]	Canopy Overhang (ft)[a]			Dominant Tree Species[b,c]		Number of Observed Trees with Diameter Greater than 16 in. at Breast Height		Observed Substrate Suitable for Nursery Sites[d]	
	Left Bank	Right Bank	Complete Overhang	Left Bank	Right Bank	Left Bank	Right Bank	Left Bank	Right Bank
1			yes	AE	AE,GA	0	0	yes(S)	no
2			yes	BC,WA	BC,WA	1	0	no	yes(S,H)
3			yes	BE,BC	WA,BE	0	1	yes(S)	yes(S)
4			yes	SY,SM,BE	SH,RO,SU	5	0	no	yes(S,H)
5			yes (intermittent)	SY,BE,BW	SY,BE,BW	0	0	no	yes(S)
6			yes	SU	BW,SU	0	1	no	yes(L)
7			yes	SY,AB	SU,AB	>5	>5	no	no
8	20	20		GA,SY	SY	0	0	yes(S)	no
9	10	10		BL	BL,SY	0	0	no	yes(S,H)
10	15-20	15-20		AE	AE,SY	0	0	no	yes(S)
11			yes	BW,BE	WA	0	0	no	no
12			yes	AB	RM,BE	0	0	yes(S)	no
13			yes	SM,RM	AE,RM	>5	>5	yes(S)	no
14			yes	SM,RM	AE,RM	0	0	yes(S)	yes(S)
15			yes	RM,BC	RM	0	>5	no	yes(S)
16			yes	SY,BW	SU	0	0	no	yes(S)
17			yes (intermittent)	RM	BL,AE,RM	0	1	no	yes(S)

TABLE 1
Field Results for Indiana Bat Habitat Survey Along 31 Miles of MFLBC

Point[a]	Canopy Overhang (ft)[a]			Dominant Tree Species[b,c]		Number of Observed Trees with Diameter Greater than 16 in. at Breast Height		Observed Substrate Suitable for Nursery Sites[d]	
	Left Bank	Right Bank	Complete Overhang	Left Bank	Right Bank	Left Bank	Right Bank	Left Bank	Right Bank
18			yes	SU,RM	SU,AE	5	3	yes(S)	no
19	<1, except for one isolated tree, emergent wetland and crop cover dominate this area	<1 emergent wetland and crop cover dominate this area		BW	no trees	1	0	no	no
20	12	<1		AE,BC	BL	1	1	yes(S)	yes(S)
21	20	20		SM	SM	6	5	yes(S)	no
22	20	30		AB,SM,RM	SU	6	5	yes(S)	yes(S)
23			yes	SM	HE,RM	8	6	no	no
24	25	25		AB,AE	SU,RM	11	12	no	no
25			yes	SM	RM,SM	6	19	no	no
26	9-23	8-20		SM,AE	HE,AB	7	>16	no	no
27			yes	SM,SY,BC	SU	13	9	no	no
28	22	25		SY.SU	SU	12	17	no	no
29	20	20		SM,BW,HL	SM,SU,RM	10	5	yes(S)	yes(S)

TABLE 1
Field Results for Indiana Bat Habitat Survey Along 31 Miles of MFLBC

Point[c]	Canopy Overhang (ft)[a]			Dominant Tree Species[b,c]		Number of Observed Trees with Diameter Greater than 16 in. at Breast Height		Observed Substrate Suitable for Nursery Sites[d]	
	Left Bank	Right Bank	Complete Overhang	Left Bank	Right Bank	Left Bank	Right Bank	Left Bank	Right Bank
30	25, isolated stands of trees and mowed grass	20		SM,BW,HL	SM,SU,RM	0	3	yes(S)	yes(S)
31	12, isolated stands of trees and mowed grass	19		SM,BW	BW,SM,AE	1	2	no	no
32	no trees, area is industrial with no cover	20		no trees	CW,AE,RO	0	5	no	yes(S)

TABLE 1
Field Results for Indiana Bat Habitat Survey Along 31 Miles of MFLBC

Point[e]	Canopy Overhang (ft)[a]			Dominant Tree Species[b,c]		Number of Observed Trees with Diameter Greater than 16 in. at Breast Height		Observed Substrate Suitable for Nursery Sites[d]	
	Left Bank	Right Bank	Complete Overhang	Left Bank	Right Bank	Left Bank	Right Bank	Left Bank	Right Bank

[a] Canopy overhang was recorded for each forested bank if overhang did not extend completely across stream. Complete overhang or overhang at least nine feet from one or both banks is consistent with Indiana bat foraging habitat.

[b] Dominant tree species were those with basal area 20% or more of the total overstory basal area.

[c] Tree species are as follows (species with * are known from the literature to be consistent with Indiana bat foraging habitat):

AB-American beech *(Fagus grandifolia)*
AE-American elm *(Ulmus americana)*
BC-black cherry *(Prunus serotina)*
BE-boxelder *(Acer negundo)**
BL-black walnut *(Juglans nigra)**
BW-black willow *(Salix nigra)**
CW-cottonwood *(Populus deltoides)**
GA-green ash *(Fraxinus pennsylvanica)*
HE-hemlock *(Tsuga canadensis)*
HL-honeylocust *(Gleditsia triacanthos)*
RM-red maple *(Acer rubrum)*
RO-red oak *(Quercus rubra)**
SH-shagbark hickory *(Hicoria ouata)*
SM-silver maple *(Acer saccharinum)**
SU-sugar maple *(Acer saccharum)*
SY-sycamore *(Platanus occidentalis)**
WA-white ash *(Fraxinus americana)*

[d] Letters in parentheses indicate the following:

S-Standing dead with cavities of exfoliating bark observed.
L-Living tree with cavities or dead branches with exfoliating bark.
H-Shagbark hickory trees observed.

[e] Observation points are at approximate one-mile intervals

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this sampling bias, notes were made in the field between each formal survey point (see Attachment N1-A). These notes provide additional information on potential nursery substrates as well as spacial trends in canopy overhang and tree species. By combining the point survey data and supplemental information, the MFLBC can be segregated into reaches designated as potentially suitable or unsuitable for Indiana bat foraging/nursery habitat. These reach segregations are described below and presented on Figure 1.

The suitability of an area for Indiana bat habitat is based on comparison to evaluation criteria for both foraging and nursery habitat. This information was in many cases supplemented with field notes on the suitability of areas between survey points (see Attachment N1-A for field notes). Optimal habitat is habitat that meets all four of the evaluation criteria in Table 1 for both foraging and nursery habitat. These criteria are:

1. Canopy overhang of 10 feet or greater beyond the streambank;

2. Presence of riparian and flood plain forests dominated by sycamore, cottonwood, black walnut, black willow, silver maple, boxelder, and oaks;

3. Presence of riparian zone trees greater than 16 inches dbh; and

4. Presence of standing dead/dying trees with bark exfoliation or cavities, living trees with evident cavities, or tree species with naturally-exfoliating bark (e.g., shagbark hickory) within 1 km of riparian areas with adequate exposure to sunlight (nursery habitat).

Optimal habitat is habitat which meets all four of the evaluation criteria for both foraging and nursery habitat. Potentially suitable habitat met two or more of the criteria for foraging and nursery habitat. A suitable habitat met none or one of the criteria for foraging and nursery habitat. Judgement on the suitability of stretches was supplemented by field notes.

Reach 1: MFLBC between the Crane Deming Facility and 1,800 feet below Middletown Road

Reach 1 extends from a point on MFLBC immediate to the Crane Deming Facility downstream to approximately 1,800 feet below Middletown Road and includes survey

Points #1-#8. Overall, this reach can be characterized as exhibiting tree species, tree sizes, canopy overhang, and nursery substrates potentially suitable for the Indiana bat.

All survey points and almost all the area in between exhibited canopy overhang that was complete or greater than nine feet from one or both banks. Although the survey at Point #5 shows complete canopy overhang, it should be noted that the overhang is intermittent for a distance of approximately 600 feet upstream and 200 feet downstream of this point. In this area, the creek exhibits 50-yard-long areas of complete overhang interspersed with equivalent stretches of shrub/scrub with overhangs of less that six feet. The short lengths of open shrub/scrub riparian areas immediate to Point #5 were not judged to be of sufficient size to present a barrier to foraging by a species such as the Indiana bat.

Although survey Points #1 and #2 show no tree species associated with Indiana bat habitat, stands of red oak, maples, and black willows and individual shagbark hickories (species associated with the bat) were noted in the riparian zone of the creek between Points #1 and #2 and #2 and #3. Survey points #1 and #2 were not considered suitable habitat for the Indiana bat. Points #3-#8 exhibited tree species that can potentially provide habitat for Indiana bats.

Trees with diameters greater than 16 inches were observed at all survey points in this reach, except Points #1, #5, and #8. However, trees of this size were noted within 300 feet of Points #1 and #5 and 500 feet of Point #8.

Substrates potentially suitable for Indiana bat nursery sites were observed at all survey points in this reach except Point #7.

Reach 2: MFLBC between 1,800 and 6,400 feet below Middletown Road

Reach 2 extends for a 4,600-foot distance downstream from approximately 1,800 feet below Middletown Road and includes only survey Point #9. This area is judged to be only potentially foraging habitat for the Indiana bat due to a lack of consistent canopy overhang. Only isolated riparian trees extend over the stream (at Point #9 this overhang is 10 feet from both banks). Potentially suitable nursery structures were noted in Reach 2.

Reach 3: MFLBC between 6,400 feet below Middletown Road and the old Conrail railroad bridge

Reach 3 extends from 6,400 feet below Middletown Road to the old Conrail railroad bridge just north of the town of Franklin Square and includes survey Points #10-#18. Overall, this reach can be characterized as exhibiting tree species, tree sizes, canopy overhang, and nursery substrates potentially suitable for the Indiana bat.

All survey points and almost all areas in between exhibited either complete canopy overhang or canopy overhang extending beyond nine feet from one or both banks. An exception to this characterization lies in the vicinity of the Butcher Road Bridge, where approximately 600 feet of the stream are bounded by shrub/scrub with isolated trees. This area exhibits limited canopy overhanging the stream channel.

The exception to this was a change in dominant vegetative cover of the area midway between survey points #15 and #16 through the 90-degree bend between survey points #16 and #17. This area was dominated by Japanese Knotweed *(Polygonum cuspidatum)*, an exotic invasive herbaceous species which grows up to 10 feet high. The knotweed dominated most of the area between the points described above, except for a small wooded area near survey point #16. Since most of this area is dominated by Knotweed to the exclusion of most large riparian tree species, this area probably does not represent potentially suitable habitat for the Indiana Bat.

All survey points except #15 and #18 exhibited dominant tree species that are reported in the literature to provide habitat for Indiana bats. At survey Points #15 and #18, red maples and sugar maples, but not silver maples, were dominant tree species.

While trees greater than 16 inches in diameter were not observed at survey Points #10, #11, #12, #14 and #16, many large trees were observed between Points #13 and #14 and between #16 and #17. The lack of large diameter trees in the area defined by Points #10-#12 suggests something less than "optimal" foraging habitat.

Substrates potentially suitable for nursery sites were observed at all survey points except #11. However, many standing dead trees were noted between Points #11 and #12.

Reach 4: MFLBC between the old Conrail railroad bridge and 1,300 feet below Highway 558

Reach 4 extends from the old Conrail railroad bridge to approximately 1,300 feet below Highway 558 and includes survey Point #19. This area is almost devoid of any riparian trees with the surrounding land in agriculture or emergent wetlands. The lack of large trees and an overstory canopy precludes this area from being considered either foraging or nursery habitat for the Indiana bat.

Reach 5: MFLBC 1,300 feet below Highway 558 to the Lisbon Spillway

Reach 5 extends from a point approximately 1,300 feet below Highway 558 to the spillway at the town of Lisbon and includes survey Points #20-#27. This reach can be characterized as exhibiting tree species, tree sizes, canopy overhang, and nursery substrates potentially suitable for the Indiana bat.

All survey points and areas between the survey points exhibited significant canopy overhang. Trees greater than 16 inches in diameter were observed at all survey points. With the exception of survey Point #24, all points exhibited dominant tree species reported in the literature to provide habitat for Indiana bats. As in Reach 3, the morphological similarity of sugar and red maples (which were observed at Point #24) to silver maples was considered sufficient to include these species in the list of potential forage habitat trees for the Indiana bat. In addition, silver maples were observed at Point #24 and the areas surrounding the survey point, but were not numerous enough to be designated as dominant species.

Substrates potentially suitable for nursery sites were observed at survey Points #20-#22 but not at Points #23-#27. However, standing dead trees or living trees with large cavities were observed between Points #22-#23, #24-#25, #25-#26, and #26-#27.

Reach 6: MFLBC from Lisbon Spillway to 800 feet below the Route 30 Bridge

Reach 6 extends from the spillway at Lisbon to 800 feet below the Route 30 Bridge and includes survey Points #28 and #29. This reach exhibited potentially suitable habitat for the Indiana bat in terms of canopy cover, tree species and size, and (in the case of Point #29) the presence of substrate for nursery sites. The canopy overhang for Points #28 and #29 extends greater than nine feet over the stream. Dominant tree species are those known from

other areas to provide habitat for Indiana bats. Structures potentially suitable for nursery sites were observed at Point #29 but not at Point #28.

Reach 7: MFLBC from 800 feet below Route 30 to Market Street

Reach 7 encompasses Points #30-#32 in the area adjacent to the town of Lisbon. Beyond 800 feet below the Route 30 Bridge, the reach should be considered marginal foraging habitat in the area extending to a point approximately 500 feet upstream from the bridge at Market Street. The characterization of this area as marginal habitat is based upon the observations that there is little forest cover along the highly developed Lisbon side of MFLBC from a point just downstream from the Route 30 Bridge down to Market Street, and the canopy overhang measurements for the left bank survey Points #30 and #31 are for isolated stands of trees not continuous cover. Point #32 is unvegetated on the Lisbon bank and is a steep forested cliff opposite the town. The majority of canopy cover is associated with the bank opposite of Lisbon (the right bank). The canopy overhang on the right bank is also not continuous. An approximate 500-foot interval just downstream from Route 164 is the site of industrial activity and is devoid of trees. The forested portions of the right bank below Route 30 exhibit a potentially suitable foraging habitat and some potentially suitable substrates for nursery sites.

Tributaries to MFLBC

Tributaries to MFLBC were investigated for potential bat foraging habitat at a point about 0.6 miles upstream of its confluence or to an upstream point deemed practical for navigation by the field investigators. A total of 11 tributaries were surveyed for canopy overhang and dominant tree species. In addition, observations of the tributary flow were noted. Of the 11 tributaries, #2, #5, #6, #8, and #10 are judged unlikely to provide foraging habitat for Indiana bats. Tributary #5 is less than 100 feet in length and is therefore not likely to be used by bats in preference to the main channel of MFLBC in that area. Tributary #6 drains a shrub/scrub area, not woodlands, therefore not offering the potentially suitable forest canopy overhang. Similarly, Tributary #8 drains an emergent wetland devoid of trees. Tributaries #2 and #10 are dominated by red and sugar maples but not silver maples. The detailed results of the tributaries survey are as follows:

Tributary #1 A tributary enters MFLBC on the right bank immediately downstream from survey Point #7. The flow of water from this tributary was judged to be extremely small with only intermittent pools of surface water visible in the channel. The area drained by this tributary exhibited complete canopy overhang, with an overstory dominated by boxelders and red maples.

Tributary #2 A tributary with noticeable flow enters the left side of MFLBC approximately 0.3 mile downstream of survey Point #8. The surrounding land immediate to its confluence with MFLBC was sparsely treed; however, approximately 500 yards upstream the tributary has complete canopy cover. Red and sugar maple are the dominant overstory.

Tributary #3 A tributary enters the left side of MFLBC at survey Point #12. This tributary was several feet wide and in a heavily forested area. Canopy cover was complete and dominated by silver maples.

Tributary #4 A tributary enters the left side of MFLBC at survey Point #14. This tributary exhibited significant flow and drained an area of complete canopy overhang dominated by silver and red maples.

Tributary #5 A short tributary enters the left side of MFLBC roughly 0.5 mile below survey Point #16. This tributary is less than 100 feet in length and drains an emergent wetland area. The lack of tree cover suggests that this tributary would not be suitable Indiana bat habitat.

Tributary #6 A tributary enters the left side of MFLBC 0.5 mile below survey Point #18. This tributary drained an area of shrub/scrub with no forest cover. The lack of tree cover suggests that this tributary would not be suitable Indiana bat habitat.

Tributary #7 A tributary enters the right side of MFLBC immediately downstream of Tributary #6. This tributary has complete canopy overhang dominated by

red and silver maples. Numerous standing dead trees were also noted along this tributary.

Tributary #8 A large tributary enters the left side of MFLBC immediately downstream of Point #19. The tributary flows under Lisbon-Canfield Road and drains an emergent wetland with no trees. The lack of tree cover suggests that this tributary would not be suitable Indiana bat habitat.

Tributary #9 A tributary enters the right side of MFLBC just downstream of survey Point #22. This tributary was approximate 1.5 feet wide, less than 1 foot deep, and has complete canopy overhang dominated by black walnut and silver maple.

Tributary #10 A small tributary enters the right side of MFLBC just upstream of the covered bridge at Eagleton Road. This tributary was less than 1.5 feet across and only a few inches deep. The tributary drained an area of complete canopy overhang dominated by red and sugar maples.

Tributary #11 A large tributary enters the right side of MFLBC approximately 0.6 miles down from the covered bridge. The tributary was 8 to 10 feet wide and had complete canopy overhang dominated by sycamore, silver maple, and tulip poplar.

B. Comparison of Potentially Suitable Foraging Habitat Areas with Benthic Macroinvertebrate Data

Figure 2 presents a comparison of the MFLBC reaches and tributaries considered to be potentially suitable foraging habitat for Indiana bats with the results of Ohio EPA benthic macroinvertebrate surveys in MFLBC. The Ohio EPA survey found at least two of the four orders of aquatic insects that are reported in the literature to be components of the Indiana bat diet to be present in the reaches designated as having potentially suitable bat habitat. These results suggest that the MFLBC in areas of suitable foraging habitat could potentially provide a base of emergent insect prey for bats.

IV. LIMITATIONS OF THE STUDY

A. Physical Limitations of Field Observation Methods

By design, the study used the MFLBC stream channel as the point from which observations were made. Tree stand densities and topography limited the distance over which accurate line-of-site observations of nursery structures and trees greater than 16 inches dbh could be made. This was particularly apparent in Reach 5 where steeply sloped banks and dense stands of sugar maples severely limited the effective range of visual observations.

B. Application Limitations of the Survey

This survey was based on habitat parameters, selected from the publicly available literature, observed in areas used by Indiana bats in other geographic locations. Although Salem and Mahoning Counties are in the general geographic range of the Indiana bat, no data are available to confirm the bat's current or historical use of the MFLBC watershed. In the absence of use data, there is a level of uncertainty in extrapolating the habitat parameters from the study areas reported in the literature to the MFLBC study area. As a consequence, this survey can only be used to identify potentially suitable habitats for Indiana bats. It cannot be used to determine the probability that Indiana bats actually use or have used the potentially suitable habitats identified for MFLBC.

V. CONCLUSIONS

While there are no available data to confirm or discount the use of MFLBC by the Indiana bat, the habitat suitability evaluation confirmed the presence of potentially suitable habitat in the study area. On this basis, and because MFLBC is within its general geographic range, the Indiana bat can be considered a potential receptor for the MFLBC ecological risk assessment.

Much of the 31-mile stretch of MFLBC that was surveyed did exhibit characteristics consistent with the foraging and nursery habitat reported in the literature for the Indiana bat. Exceptions included an area upstream of State Route 45 (Reach 2) and the Franklin Square area (Reach 4) where stream canopy cover was lacking, and below State Route 30 near the town of Lisbon (Reach 7) where the area is industrialized. In addition, six of the eleven MFLBC tributaries that were surveyed exhibited suitable characteristics to consider them as potential Indiana bat habitat. The Ohio EPA benthic macroinvertebrate data suggest that MFLBC could potentially provide a base of emergent insect prey if, in fact, the Indiana bat was to inhabit this area.

The survey results are qualitative; Figure 1 depicts areas along MFLBC that could be considered either potentially suitable or unsuitable habitat. Quantification of the areal extent of potential habitat was not the objective of the survey, nor can the results be used to infer such (i.e., the hatched areas on the map represent distance along the length of MFLBC but not the distance perpendicular to the stream channel). Interpretation of the results within the context of the ecological risk assessment will be presented subsequently.

VI. REFERENCES

Belwood, J.J. 1979. Feeding ecology of an Indiana bat communitywith emphasis on the endangered Indiana bat, Myotis sodalsi. Masters Thesis, University of Florida. 105 pp.

Gardner, J.E., and T.L. Gardner. 1980. Determination of the presence and habitat suitability for the Indiana bat (Myotis sodalis) and gray bat (Myotis grisescens) for portions of the lower 6.6 miles of McKee Creek Drainage and Levee District, Pike County, Illinois. Saint Louis District, U.S. Army Corps of Engineers, Saint Louis, MO. 22 pp.

Humphrey, S.R., A.R. Richter, and J.B. Cope. 1977. Summer habitat and ecology of the endangered Indiana bat, *Myotis sodalis. J. Mamm.* 58: 334-346.

Ohio Environmental Protection Agency (OEPA). 1985. Raw data of 1985 OEPA biological survey of Little Beaver Creek, its branches, and selected tributaries. Submitted to ENVIRON Corporation by OEPA June 1993.

Ruetgers-Nease Corporation. Proposed Work Plan for Evaluating the Suitability of the Middle Fork of Little Beaver Creek, Ohio, as Habitat for the Indiana Bat (*Myotis sodalis*). September 22, 1993. 7 pages.

United States Fish and Wildlife Service. 1983. Recovery Plan for theIndiana bat. United States Department of the Interior, Fish and Wildlife Service. Available from Fish and Wildlife Reference Service, 1776 E. Jefferson Street, Rockville, MD.

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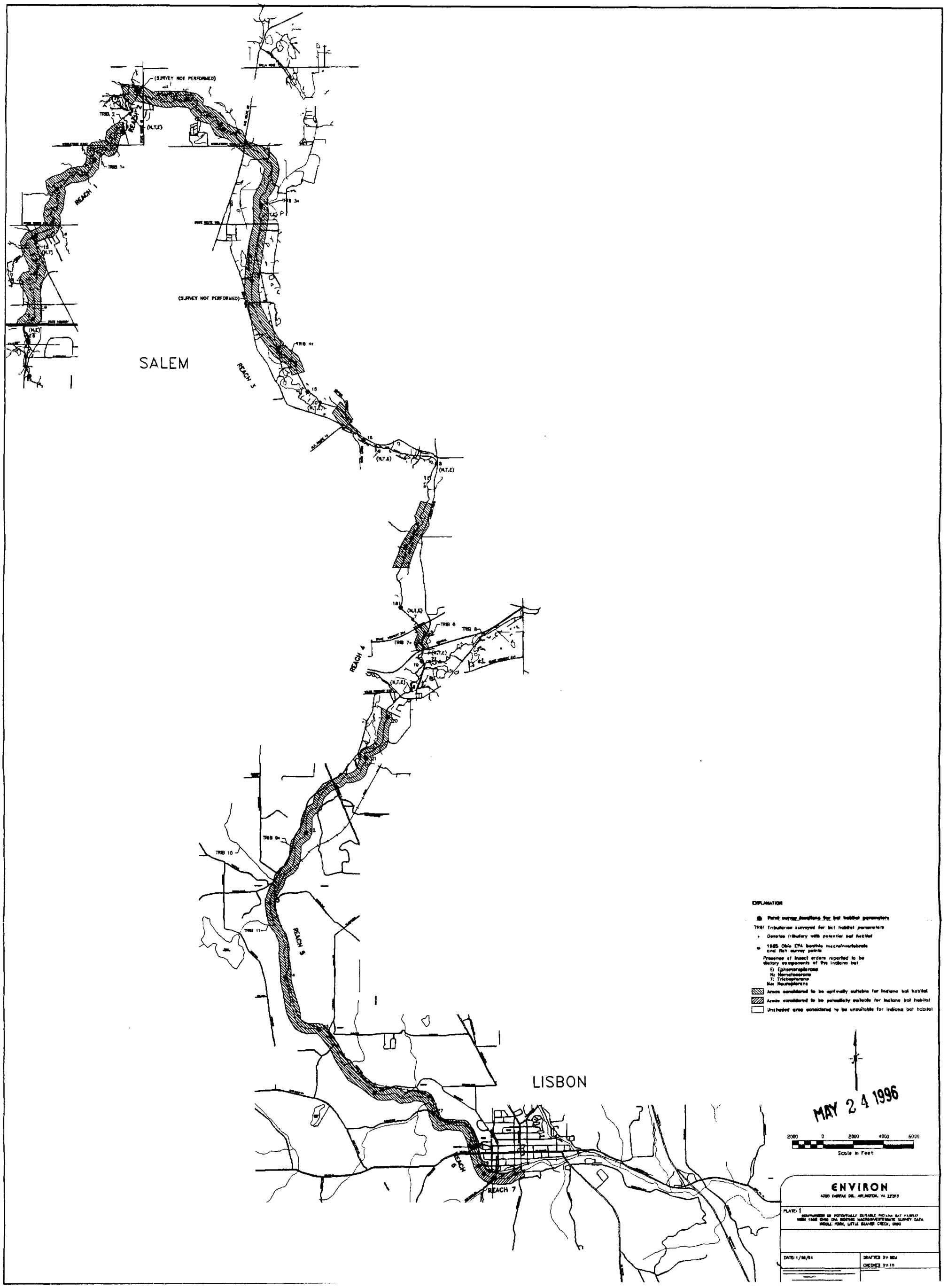
FIGURE 1

SURVEY POINTS, REACH SEGREGATIONS, AREAS OF POTENTIALLY SUITABLE INDIANA BAT HABITAT, AND OHIO EPA BENTHIC MACROINVERTEBRATE SURVEY RESULTS


(SURVEY NOT PERFORMED)
TRIB 2
REACH 2
(N,T,E)
TRIB 1
REACH 1
TRIB 34
(N,T,E)
(SURVEY NOT PERFORMED)
SALEM
TRIB 44
REACH 3
(N,T,E)
(N,T,E)
(N,T,E)
(N,T,E)
TRIB 8
TRIB 7
REACH 4
(N,T,E)
(N,T,E)
TRIB 9
TRIB 10
TRIB 11
REACH 5
LISBON
REACH 6
REACH 7
EXPLANATION
Point survey sampling for bat habitat parameters
TRIB Tributaries surveyed for bat habitat parameters
Denotes tributary with potential bat habitat
1985 Ohio EPA benthic macroinvertebrate and fish survey points
Presence of insect orders reported to be dietary components of the Indiana bat
E: Ephemeroptera
N: Hemiptera
T: Trichoptera
M: Neuroptera
Areas considered to be optimally suitable for Indiana bat habitat
Areas considered to be potentially suitable for Indiana bat habitat
Unshaded area considered to be unsuitable for Indiana bat habitat
MAY 24 1996
2000 0 2000 4000 6000
Scale in Feet
ENVIRON
4350 FAIRFAX DR. ARLINGTON, VA 22203
PLATE: 1
DATED 1/30/96
DRAFTED BY MEM
CHECKED BY